UNITED STATES PATENT AND TRADEMARK OFFICE

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UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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Ex parte GUY ROSMAN, ALEXANDER BRONSTEIN,
MICHAEL BRONSTEIN, and RON KIMMEL

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Appeal 2017-009696
Application 14/093,671
Technology Center 2100

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Before JOHN A. JEFFERY, JAMES R. HUGHES, and SCOTT E. BAIN,
Administrative Patent Judges.

JEFFERY, *Administrative Patent Judge.*

DECISION ON APPEAL

Appellants[1] appeal under 35 U.S.C. § 134(a) from the Examiner's
decision to reject claims 1–5, 7–15, 17–25, and 27–30. We have jurisdiction
under 35 U.S.C. § 6(b). We affirm.

STATEMENT OF THE CASE

Appellants' invention analyzes multidimensional data sets and, in
particular, involves multidimensional scaling (MDS) techniques using vector
extrapolation to reduce iterations in obtaining a solution point. Because
existing MDS algorithms require many computationally-intensive iterations,

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[1] Appellants identify the real party in interest as Technion Research and
Development Foundation. App. Br. 3.

the disclosed invention uses vector extrapolation techniques to accelerate the numerical solution of MDS problems. *See generally* Abstract; Spec. 1, 10. Claims 1 and 3 are illustrative:

> 1.   One or more non-transitory computer readable storage media using instructions stored thereon, which, when executed, cause a machine to perform a method, the method comprising:
>
> (i)   applying an iterative optimization technique a predetermined amount of times on a coordinates vector, said coordinates vector representing the coordinates of a plurality of data elements of a data set, each data element identified by its coordinate and obtaining a modified coordinates vector;
>
> (ii)   applying a vector extrapolation technique on said modified coordinates vector obtaining a further modified coordinates vector; and
>
> (iii)   repeating steps (i) and (ii) until one or more predefined conditions are met.
>
> 3.   The media according to claim 1, wherein said iterative optimization technique is scaling by majorizing a complicated function (SMACOF).

THE REJECTION[2]

The Examiner rejected claims 1–5, 7–15, 17–25, and 27–30 under 35 U.S.C. § 101 as not directed to patent-eligible subject matter. Ans. 2–3.[3]

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[2] Because the Examiner withdrew an indefiniteness rejection under § 112, second paragraph (Ans. 3), that rejection is not before us.

[3] Throughout this opinion, we refer to (1) the Appeal Brief filed April 4, 2017 (supplemented May 3, 2017) ("App. Br."); (2) the Examiner's Answer mailed June 23, 2017 ("Ans."); and (3) the Reply Brief filed July 7, 2017 ("Reply Br.").

CONTENTIONS

The Examiner finds that the claimed invention is directed to an abstract idea, namely a mathematical algorithm, by merely reciting calculations and/or manipulating numerical data values according to mathematical relationships or formulas corresponding to an iterative optimization technique, including SMACOF. Ans. 2, 4. The Examiner adds that the claimed elements do not add significantly more to the abstract idea because the additional recited elements, such as the recited computer storage media, processor, and memory, amount to no more than (1) mere instructions to implement the abstract idea on a computer, and (2) generic computer structure that performs generic computer functions that are well-understood, routine, and conventional activities previously known to the pertinent industry. Ans. 2–4.

Appellants argue that not only is there no intended use recited in independent claim 1, the claimed invention improves processor operation by (1) speeding up convergence using vector extrapolation, and (2) improving results in terms of speed and accuracy as explained in the Specification's sections 4.2[4] and 5. App. Br. 6. According to Appellants, the Examiner's conclusion that the claims do not improve the computer's functioning is not only unsupported, but also rebutted by the results cited in the Specification's section 5. *Id.*

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[4] Section 4.2 corresponds to Appellants' citation of page 50, lines 5 to 8 of the Specification on page 6 of the Appeal Brief.

ISSUE

Has the Examiner erred in rejecting claims 1–5, 7–15, 17–25, and 27–30 by concluding that they are directed to ineligible subject matter under § 101? This issue turns on whether the claimed invention is directed to a patent-ineligible abstract idea and, if so, whether the claim's elements—considered individually and as an ordered combination—transform the nature of the claim into a patent-eligible application of that abstract idea.

ANALYSIS

Claims 1, 2, 4, 5, 7–12, 14, 15, 17–22, 24, 25, and 27–30

We begin by noting, as does the Examiner (Ans. 4), that only the Examiner's ineligibility rejection of dependent claims 3, 13, and 23 is contested in this appeal. *Accord* App. Br. 4, 6 (limiting the arguments to these claims).[5]

Therefore, we summarily sustain the Examiner's uncontested ineligibility rejection of claims 1, 2, 4, 5, 7–12, 14, 15, 17–22, 24, 25, and 27–30. *See* MANUAL OF PATENT EXAMINING PROCEDURE (MPEP) § 1205.02 (9th ed. Rev. 08.2017 (Jan. 2018)) ("If a ground of rejection stated by the examiner is not addressed in the appellant's brief, appellant has waived any challenge to that ground of rejection and the Board may summarily sustain

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[5] Although Appellants argue that there no intended use recited in claim 1 despite only contesting the Examiner's rejection of claims 3, 13, and 23 (*see* App. Br. 4, 6), claim 3 nevertheless depends from claim 1 and, therefore, incorporates those limitations.

it, unless the examiner subsequently withdrew the rejection in the examiner's answer.").

Claims 3, 13, and 23

Claim 3 depends from claim 1, and adds that the iterative optimization technique is SMACOF.

To determine whether claims are patent eligible under § 101, we apply the Supreme Court's two-step test articulated in *Alice Corp. Proprietary Ltd. v. CLS Bank International*, 134 S. Ct. 2347 (2014). First, we determine whether the claims are directed to a patent-ineligible concept: laws of nature, natural phenomena, and abstract ideas. *Id.* at 2354–55. If so, we then proceed to the second step and examine the claim's elements—both individually and as an ordered combination—to determine whether the claim contains an "inventive concept" sufficient to transform the claimed abstract idea into a patent-eligible application. *Id.* at 2357.

Alice Step One

Applying *Alice* step one, we agree with the Examiner that the claimed invention is directed to an abstract idea, namely a mathematical algorithm, by merely reciting calculations and/or manipulating numerical data values according to mathematical relationships or formulas corresponding to an iterative optimization technique, including SMACOF, as the Examiner indicates. Ans. 2, 4.

Independent claim 1, from which claim 3 depends, recites three steps. First, an iterative optimization technique is applied a predetermined amount of times on a coordinates vector that represents coordinates of data elements

of a data set, each data element identified by its coordinate and obtaining a modified coordinates vector. Second, a vector extrapolation technique is applied on the modified coordinates vector obtaining a further modified coordinates vector. These two steps are then repeated until one or more predefined conditions are met.

As noted above, there is no dispute that these limitations are directed to an abstract idea. Nor do we find that claim 3's specifying the iterative optimization technique as SMACOF changes this assessment.

As the Specification explains, the disclosed invention analyzes multidimensional data sets and, in particular, involves multidimensional scaling (MDS)[6] techniques using vector extrapolation to reduce iterations in obtaining a solution point. Spec. 1:5–8. Because existing MDS algorithms require many computationally-intensive iterations, the disclosed invention uses vector extrapolation techniques to accelerate the numerical solution of MDS problems. Spec. 10:6–8. Although any iterative optimization technique can be used, a preferred embodiment uses a stress function as an error measure, and the iterative optimization technique is SMACOF. Spec. 10:25–28.

A SMACOF algorithm is detailed on pages 16 and 17 of the Specification. Due to this algorithm's slow convergence, a large number of

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[6] MDS is a generic name for a family of algorithms that, given a matrix representing the pair wise distances between a set of points in some abstract metric space, attempts to find a representation of these points in a low-dimensional (typically Euclidean) space. Spec. 1:20–23; 9:21–23. MDS can be applied in different fields including, among other things, (1) visualizing abstract data, (2) machine learning for pattern recognition, (3) image retrieval, (4) geometric surfaces processing, etc. Spec. 11:15–23.

iterations may be required if high accuracy is needed, depending on the data set size and distance matrix composition. Spec. 17:14–21. This convergence is, therefore, accelerated using vector extrapolation. Spec. 50:4–8.

In essence, claim 3 is directed to a mathematical algorithm—an abstract idea as the Examiner indicates. Ans. 2, 4. As the Examiner explains (Ans. 2), claim 3 is analogous to the mathematical algorithm at issue in *Gottschalk v. Benson*, 409 U.S. 63 (1972). In *Benson*, the U.S. Supreme Court held that claims involving a mathematical algorithm and directed to a method for converting binary-coded-decimal (BCD) numerals into pure binary numerals for use with a computer were ineligible under § 101. *Benson*, 409 U.S. at 68–72. In reaching this conclusion, the Court emphasized that the claim at issue was so abstract and sweeping as to cover both known and unknown uses of the BCD to pure binary conversion, and that the mathematical formula had no substantial practical application except in connection with a digital computer. *Id.* at 68, 71–72.

That is the case here, for the claimed invention—like that in *Benson*—is directed to an abstract idea, namely a mathematical algorithm. *Accord Ex parte Gutta*, 93 USPQ2d 1025, 1027–35 (BPAI 2009) (precedential) (holding that claims directed to a mathematical algorithm, namely identifying mean items by (1) computing a symbolic value variance, and (2) selecting a mean item with a symbolic value minimizing the variance, were ineligible under § 101).

Appellants' reliance on *McRO, Inc. v. Bandai Namco Games America, Inc.*, 837 F.3d 1299 (Fed. Cir. 2016) on page 6 of the Appeal Brief is unavailing. There, the claimed process used a combined order of specific

rules that rendered information in a specific format that was applied to create a sequence of synchronized, animated characters. *McRO*, 837 F.3d at 1315. Notably, the recited process *automatically animated characters* using particular information and techniques—an improvement over manual three-dimensional animation techniques that was not directed to an abstract idea. *Id.* at 1316.

But unlike *McRO*, the claimed invention here applies SMACOF iterative optimization and vector extrapolation techniques repetitively until a predefined condition is met. Although these repetitive applications may be beneficial, a claim for a useful or beneficial abstract idea is still an abstract idea. *See Ariosa Diagnostics, Inc. v. Sequenom, Inc.*, 788 F.3d 1371, 1379–80 (Fed. Cir. 2015).

We, therefore, agree with the Examiner that claim 3 is directed to an abstract idea.

Alice Step Two

Nor do the recited elements—considered individually and as an ordered combination—transform the nature of claim 3 into a patent-eligible application of the abstract idea to ensure that the claim amounts to significantly more than that idea. *See Alice*, 134 S. Ct. at 2357.

That some claims recite computer readable storage media, or a memory coupled to a processor does not change our conclusion. As the Examiner indicates, the claimed invention merely uses generic computing components to perform the recited abstract idea. Ans. 2–4. Merely reciting these generic computing components cannot transform a patent-ineligible abstract idea into a patent-eligible invention. *Id.* at 2358. In other words,

merely reciting an abstract idea while adding the words "apply it with a computer" does not render an abstract idea non-abstract: there must be more. *See Alice*, 134 S. Ct. at 2359.

Indeed, these generic computing components merely do that which can be performed mentally or with a pen and paper—exclusive functions ineligible for patent protection under § 101. *See CyberSource Corp. v. Retail Decisions, Inc.*, 654 F.3d 1366, 1372, 1375 (Fed. Cir. 2011) ("That purely mental processes can be unpatentable, even when performed by a computer, was precisely the holding of the Supreme Court in *Gottschalk v. Benson*."). That claim 13[7] and its respective independent claim 11 do not even recite a computer only further underscores the notion that these steps could be performed entirely mentally or with pen and paper.

Nor are we persuaded that the claimed invention improves the computer processor device's functionality or efficiency, or otherwise changes the way that device functions, at least in the sense contemplated by the Federal Circuit in *Enfish LLC v. Microsoft Corporation*, 822 F.3d 1327 (Fed. Cir. 2016), despite Appellants' arguments to the contrary (App. Br. 6; Reply Br. 1–2). Leaving aside the fact that Appellants do not cite *Enfish* in the Appeal Brief despite *Enfish* predating that brief, Appellants' reliance on *Enfish* in the Reply Brief is nonetheless unavailing.

The claimed self-referential table in *Enfish* was a specific type of data structure designed to improve the way a computer stores and retrieves data in memory. *Enfish*, 822 F.3d at 1339. To the extent that Appellants contend

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[7] Because claim 13 contains an apparent typographical error, we presume that the term "jaorizing" is intended to refer to "majorizing" consistent with its usage elsewhere in the disclosure.

that the claimed invention uses such a data structure to improve a computer's functionality or efficiency, or otherwise change the way that device functions (*see* Reply Br. 1–2), there is no persuasive evidence on this record to substantiate such a contention.

To be sure, Appellants' disclosed invention accelerates SMACOF iteration convergence by vector extrapolation. Spec. 50:4–8. The Specification also explains that extrapolation methods tend to work better when a higher degree of accuracy is needed, and associated test results are presented in section 5. Spec. 50:9–53:6. But "[u]sing a computer to accelerate an ineligible mental process does not make that process patent-eligible." *Bancorp Services, L.L.C. v. Sun Life Assurance Co.*, 687 F.3d 1266, 1279 (Fed. Cir. 2012). *Accord FairWarning IP, LLC v. Iatric Systems, Inc.*, 839 F.3d 1089, 1095 (Fed. Cir. 2016) (citing *Bancorp*, 687 F.3d at 1278 ("[T]he fact that the required calculations could be performed more efficiently via a computer does not materially alter the patent eligibility of the claimed subject matter.")).

Although applying SMACOF iterative optimization and vector extrapolation techniques repetitively until a predefined condition is met as claimed may be beneficial, a claim for a useful or beneficial abstract idea is still an abstract idea. *See Ariosa*, 788 F.3d at 1379–80.

For the foregoing reasons, then, the recited elements—considered both individually and as an ordered combination—do not contain an "inventive concept" sufficient to transform the claimed abstract idea into a patent-eligible application. Therefore, we are not persuaded that the Examiner erred in rejecting claim 3, and claims 13 and 23 not argued separately with particularity.

CONCLUSION

The Examiner did not err in rejecting claims 1–5, 7–15, 17–25, and 27–30 under § 101.

DECISION

We affirm the Examiner's decision to reject claims 1–5, 7–15, 17–25, and 27–30.

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).

<u>AFFIRMED</u>