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EXAMINER

OCHOA, JUAN CARLOS

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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* JEROME R. KREBS, SUNWOONG LEE,  
and YOUNG HO CHA

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Appeal 2017-006095  
Application 14/484,603<sup>1</sup>  
Technology Center 2100

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Before ERIC B. CHEN, KAMRAN JIVANI, and SCOTT E. BAIN,  
*Administrative Patent Judges.*

CHEN, *Administrative Patent Judge.*

DECISION ON APPEAL

Appellants seek our review, under 35 U.S.C. § 134(a), of the Examiner’s final decision rejecting claims 16–19, which constitute all the claims pending in this application. Claims 1–15 and 20 have been cancelled. We have jurisdiction under 35 U.S.C. § 6(b).

We REVERSE.

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<sup>1</sup> According to Appellants, the real party in interest is “ExxonMobil Upstream Research Company.” (App. Br. 2.)

STATEMENT OF THE CASE

“The invention relates generally to the field of geophysical prospecting, and more particularly to geophysical data processing. Specifically, the invention pertains to reducing artifacts in iterative inversion of data resulting from approximations made in the inversion.” (Spec. ¶ 2.)

Claim 16, reproduced below, is illustrative of the subject matter on appeal.

16. A method comprising:

selecting, with a computer, a subset of measured data as an approximation in a computer implemented iterative geophysical data inversion, wherein the measured data correspond to active seismic sources;

executing, with the computer, a first cycle of the iterative geophysical data inversion that uses the subset of measured data as the approximation, wherein the first cycle produces an intermediate subsurface model;

varying, with the computer, the subset of measured data that is selected for processing in the iterative geophysical data inversion in at least one subsequent iterative cycle of the iterative geophysical data inversion, wherein the varying reduces an artifact in a subsequent subsurface model produced by the iterative geophysical data inversion relative to the intermediate subsurface model,

wherein the varying reduces the artifact in a final subsurface model, generated from the intermediate subsurface model through the iterative geophysical data inversion, by causing the artifact in updated subsurface models to not coherently add in leading to the final subsurface model as the iterative geophysical data inversion progresses; and

displaying, with the computer, an image of a subsurface region generated with the final subsurface model.

## REJECTIONS

Claims 16–19 stand rejected under 35 U.S.C. § 101 as being directed to non-statutory subject matter. (Final Act. 3–4.)

The rejection of claims 16–19 under 35 U.S.C. § 112(a) has been withdrawn by the Examiner. (Ans. 3.)

The rejection of claims 16–19 under 35 U.S.C. § 103(a) has been withdrawn by the Examiner. (Ans. 3.)

## ANALYSIS

We are persuaded by Appellants’ arguments (App. Br. 9–10) that independent claim 16 complies with 35 U.S.C. § 101 as statutory subject matter.

The Examiner finds claim 16 is “directed to a mathematical algorithm of reducing artifacts caused by approximations in iterative data inversion.” (Final Act. 3.) In particular, the Examiner explains the claimed “varying step . . . is part of the data inversion mathematical algorithm (described in the Specification in ¶ [038-039])” and “[m]athematical relationships and algorithms have been found by the courts to be abstract (e.g., Benson, Flook, Diehr, Grams).” (*Id.*; *see also* Ans. 5.) We do not agree with the Examiner’s finding that the claim constitutes ineligible subject matter.

The United States Supreme Court has identified a two-step framework for determining whether claimed subject matter is judicially-excepted from patent eligibility under 35 U.S.C. § 101. *Alice Corp. Pty. Ltd. v. CLS Bank Int’l*, 134 S. Ct. 2347, 2355 (2014). In *Alice*, the Supreme Court reiterated the framework set out in *Mayo Collaborative Services v. Prometheus Labs., Inc.*, 566 U.S. 66 (2012), for “distinguishing patents that claim . . . abstract

ideas from those that claim patent-eligible applications of those concepts.” *Alice*, 134 S. Ct. at 2355. Assuming that a claim nominally falls within one of the statutory categories of machine, manufacture, process, or composition of matter, the first step in the analysis is to determine if the claim is directed to a law of nature, a natural phenomenon, or an abstract idea (judicial exceptions). *Id.* If so, the second step is to determine whether any element or combination of elements in the claim is sufficient to transform the nature of the claim into a patent-eligible application. *Id.*

With respect to step one of the *Alice* analysis, our reviewing court instructs that “examiners are to continue to determine if the claim recites (i.e., sets forth or describes) a concept that is similar to concepts previously found abstract by the courts.” *Amdocs (Israel) Ltd. v. Openet Telecom, Inc.*, 841 F.3d 1288, 1294 n.2 (Fed. Cir. 2016) (citation omitted). Moreover, the Federal Circuit has articulated that “the first step in the *Alice* inquiry . . . asks whether the focus of the claims is on the specific asserted improvement in computer capabilities . . . or, instead, on a process that qualifies as an ‘abstract idea’ for which computers are invoked merely as a tool.” *Enfish, LLC v. Microsoft Corp.*, 822 F.3d 1327, 1335–36 (Fed. Cir. 2016). Accordingly, the Federal Circuit determined, if “the claims are directed to a specific implementation of a solution to a problem in the software arts,” then “the claims at issue are not directed to an abstract idea.” *Id.* at 1339.

In the “Background of the Invention” section, Appellants’ Specification discloses that “[d]ue to its high computational cost, iterative inversion often requires application of some type of approximation that speeds up the computation” and “[u]nfortunately, these approximations usually result in errors in the final inverted model which can be viewed as

*artifacts* of the approximations employed in the inversion.” (¶ 7.) Thus, according to Appellants’ Specification, “[w]hat is needed is a general method of iteratively inverting data that allows for the application of approximations without generating artifacts in the resulting inverted model” and “[t]he present invention satisfies this need.” (¶ 8.)

Appellants’ Specification discloses:

Figures 10–13 represent a synthetic example of performing inversion using an approximation to the measured data. An example of such an approximation is using a subset of the measured data (1010 in Fig. 10). *This approximation reduces the amount of measured data, which speeds up the inversion, because the computational time of the inversion is directly proportional to the number of measured data.*

(¶ 48 (emphasis added).) Appellants’ Specification discloses “[i]n this example, in step 1060, a subset of the measured data is randomly selected as inversion iteration increases” and “[t]his results in *a different subset of the data being used in each iteration cycle.*” (¶ 49 (emphasis added).)

Moreover, Appellants’ Specification discloses:

Figure 13 shows the results of applying the inversion method outlined in the flowchart in Fig. 6, *but eliminating the inventive, artifact-reducing step 1060.* It may be noted that the inversion in Fig. 13 has artificial footprints at deeper parts below 2000 meters and short wavelength noises in the overall inverted model, *whereas this footprint noises are mitigated in the inversion using the present inventive method (Fig. 12), and the short wavelength noises are invisible.*

(¶ 50 (emphases added).) Accordingly, Appellants’ invention provides for “a general method of iteratively inverting data that allows for the application of approximations without generating artifacts in the resulting inverted model” (¶ 8) by using “a different subset of the data being used in each

iteration cycle,” the subset being an example of an approximation of the measured data (¶ 49).

Thus, Appellants’ claimed invention is a “specific asserted improvement in computer capabilities” rather than “a process that qualifies as an ‘abstract idea’ for which computers are invoked merely as a tool.” *See Enfish*, 822 F.3d at 1335–36. Accordingly, because “the claims are directed to a specific implementation of a solution to a problem in the software arts,” claim 16 is not directed toward an abstract idea. *See id.* at 1339.

We are persuaded by Appellants’ arguments that “the claimed invention is an improvement in computer capabilities as the computer can create a more accurate (i.e., less artifacts) subsurface image (see Applicant’s Fig. 12 contrasted to Fig. 13) coupled with a computer speed-up” and “the claimed invention is rooted in computer technology as evidenced by the speed up in and improvement of the computer’s ability to generate subsurface imagery.” (App. Br. 10.) The Examiner, therefore, erred in finding claim 16 is directed towards non-statutory subject matter.

Accordingly, we do not sustain the rejection of independent claim 16 under 35 U.S.C. § 101. Claims 17–19 depend from independent claim 16. We do not sustain the rejection of claims 17–19 under 35 U.S.C. § 101 for the same reasons discussed with respect to independent claim 16.

#### DECISION

The Examiner’s decision rejecting claims 16–19 is reversed.

#### REVERSED