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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte JAMES J. REIS, CARL SONNIER, JOE JONES, MARK L. SANFORD, and EDWARD SAADE

Appeal 2017-005279
Application 13/961,567[1]
Technology Center 3600

Before LINDA E. HORNER, BRETT C. MARTIN, and PAUL J. KORNICZKY, *Administrative Patent Judges*.

HORNER, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Appellant seeks our review under 35 U.S.C. § 134(a) of the Examiner's decision rejecting claims 1–7, 15–21, 23, 24, and 28–33 under 35 U.S.C. § 101 as being directed to patent ineligible subject matter. Final Office Action (May 19, 2016) (hereinafter "Final Act."), as modified by a

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[1] FUGRO EARTHDATA, INC. ("Appellant") is the applicant as provided for under 37 C.F.R. § 1.46. Appellant identifies FUGRO N.V. as the real party in interest by virtue of an assignment of the application from FUGRO EARTHDATA, INC. Reply Brief 2 (February 13, 2017) (hereinafter "Reply Br.").

first Advisory Action (July 5, 2016) (hereinafter "First Adv. Act.") and a second Advisory Action (August 26, 2016) (hereinafter "Second Adv. Act.").[2] We have jurisdiction under 35 U.S.C. § 6(b).

The claimed subject matter relates to mapping and characterizing sea ice from synthetic aperture radar (SAR) measurements. Substitute Specification ¶¶ 11 (October 8, 2013) (hereinafter "Spec."). The ability to characterize sea ice is becoming increasingly important as the makeup of ice that covers various surfaces of the globe is changing and the characteristics of the ice have changed dramatically in recent years. *Id.* ¶¶ 7–8. Both environmental concerns and natural resource concerns have a great deal of interest in measuring and characterizing regions of the earth that have ice coverage. *Id.* The structure, thickness, and location of sea ice are of particular interest. *Id.*

The claimed subject matter uses dual frequency (X- and P-band) data acquired from synthetic aperture radar (SAR) systems to determine sea ice depth and the presence of leads in the ice floe. *Id.* ¶ 13. The P-band SAR penetrates ice to 5 to 10 meters or more, while the X-band SAR images the surface of the ice. *Id.* The claimed subject matter also uses co-polarized (e.g., HH and VV) P-band data obtained from a SAR system to map ice structures and weak points in the ice floe. *Id.* ¶ 19.

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[2] The Final Office Action also included a rejection of claims 8–14, 22, and 25–27 under 35 U.S.C. § 101 and a rejection of claims 1–33 under pre-AIA 35 U.S.C. § 103(a). Final Act. 2, 10. The Examiner entered amendments to the claims proposed by Appellant after the Final Office Action and withdrew the rejection of claims 1–33 under § 103(a) and the rejection of claims 8–14, 22, and 25–27 under § 101. First Adv. Act. 1 (withdrawing art rejection); Second Adv. Act. 1–2 (partially withdrawing § 101 rejection and indicating claims 8–14, 22, and 25–27 are allowed).

The Examiner determined that the claims on appeal are directed to an abstract idea and do not recite additional elements that amount to significantly more than the abstract idea. First Adv. Act. 2; Second Adv. Act. 2. Appellant contends that the claims on appeal are not directed to an abstract idea because they recite the structure of specific radio imaging systems used in a technical improvement to radio-based sea ice imaging techniques. Appeal Brief 4, 11–13 (November 21, 2016) (hereinafter "Appeal Br.").

For the reasons explained below, we find that the claims on appeal are not directed to an abstract idea. Accordingly, we REVERSE.

CLAIMED SUBJECT MATTER

Of the claims on appeal, claims 1, 15, 23, 24, 28, and 31 are independent. Claim 1 is illustrative of the subject matter on appeal and is reproduced below.

> 1. A method of generating and using mapping layers, comprising:
>
> acquiring, via a synthetic aperture radar (SAR) system, full polarity SAR data over an area containing sea ice, wherein the acquired full polarity SAR data includes X-band data and P-band data;
>
> storing the acquired full polarity SAR data in a SAR database;
>
> generating layers via a processor of the SAR system by performing interferometric processing operations on the acquired full polarity SAR data that includes the X-band data and the P-band data;
>
> registering, by the processor, the generated layers one to another geographically; and
>
> determining, by the processor, a depth of the sea ice by combining the generated layers.

Appeal Br. 17 (Claims Appendix).

ISSUE

The Examiner determined that the claims are directed to the abstract idea of determining the characteristics of sea ice by generically gathering data and processing the data using a series of abstract steps or algorithms. First Adv. Act. 2; Second Adv. Act. 2. Notably, the Examiner stated that "[t]he processor . . . may provide a specialized operation in order to provide a solution to a specific problem but it does so through data manipulation." First Adv. Act. 2. The Examiner explained that "[t]he technical solution is merely programming a generic processor to determine the depth of the sea ice using generically gathered full polarity synthetic aperture radar data inserted into a series of abstract steps." *Id.* The Examiner identified the algorithm as "the improvement on the technology." *Id.* The Examiner later seemingly contradicts this finding by stating that "[t]he claims are not a technical improvement over existing manual techniques because it does not evaluate the data in a manner that is different[] than manual techniques would have done in the past." Ans. 4. The Examiner further finds that the steps of the claims use "generic computer operations and do not improve the operation of the computer or SAR system." *Id.* at 5.

Appellant contends that the Examiner's description of the claims as being directed to determining the characteristics of sea ice overly generalizes the recited claim elements and fails to reflect the structure and specific technical operations of the claim elements. Appeal Br. 11. Appellant also contends that the Examiner has failed to demonstrate that the claim elements are merely the automation of tasks by a general purpose computer. *Id.* Appellant argues that "the recitation of claim elements directed to a

technical improvement over existing manual techniques is sufficient to remove a claim from the realm of the abstract idea." *Id.* at 11–12 (citing *McRO, Inc. v. Bandai Nanco Games America Inc.*, 837 F.3d 1299, 1316 (Fed. Cir. 2016) (internal quotation marks omitted)).[3]

The issue before us is whether the claimed subject matter is directed to a patent ineligible abstract idea.

LEGAL PRINCIPLES

A patent may be obtained for "any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof." 35 U.S.C. § 101. The Supreme Court has held that this provision contains an important implicit exception: Laws of nature, natural phenomena, and abstract ideas are not patentable. *Alice Corp. Pty. Ltd. v. CLS Bank Int'l*, 134 S. Ct. 2347, 2354 (2014); *Gottschalk v. Benson*, 409 U.S. 63, 67 (1972) ("Phenomena of nature, though just discovered, mental processes, and abstract intellectual concepts are not patentable, as they are the basic tools of scientific and technological work."). Notwithstanding that a law of nature or an abstract idea, by itself, is not patentable, the application of these concepts may be deserving of patent protection. *Mayo Collaborative Servs. v. Prometheus Labs., Inc.*, 566 U.S. 66, 71 (2012). In *Mayo*, the Court stated that "to transform an unpatentable law of nature into a patent-eligible application of such a law, one must do more than simply

[3] Appellant also argued that the claims recite significantly more than an abstract idea. Appeal Br. 13–15. We do not reach these arguments because, for the reasons discussed *infra*, we determine the claims are not directed to an abstract idea.

state the law of nature while adding the words 'apply it.'" *Id.* at 72 (citation omitted).

In *Alice*, the Court reaffirmed the framework set forth previously in *Mayo* "for distinguishing patents that claim laws of nature, natural phenomena, and abstract ideas from those that claim patent-eligible applications of these concepts." *Alice*, 134 S. Ct. at 2355. The first step in the analysis is to "determine whether the claims at issue are directed to one of those patent-ineligible concepts." *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 there are additional elements that "'transform the nature of the claim' into a patent-eligible application." *Alice*, 134 S. Ct. at 2355 (quoting *Mayo*, 566 U.S. at 79). As to the first step, the Federal Circuit recently explained, in a case involving claims directed to computer animation software, that at step one of the *Alice* test, in determining the patentability of a method, a court must look to the claims as an ordered combination, without ignoring the requirements of individual steps." *McRO, Inc. v. Bandai Namco Games America Inc.*, 837 F.3d 1299, 1313 (Fed. Cir. 2016).

The court in *McRO* determined that the computer animation claims were "limited to rules with specific characteristics" and that "[t]he specific, claimed features of these rules allow for the improvement realized by the invention." *Id.* In order to determine whether the claimed process raised a preemption concern, the court examined whether the claims "focus on a specific means or method that improves the relevant technology or are instead directed to a result or effect that itself is the abstract idea and merely

invoking generic processes and machinery." *Id.* at 1314. The court determined that the claims do not simply use a computer as a tool to automate conventional activity, finding no evidence that the process previously used by animators is the same as the process required by the claims. *Id.* Instead, the court found that "[t]he computer here is employed to perform a distinct process to automate a task previously performed by humans." *Id.* The court in *McRO* explained that "it [was] the incorporation of the claimed rules, not the use of the computer that 'improved [the] existing technological process' by allowing the automation of further tasks." *Id.* at 1313 (alteration in original) (quoting *Alice*, 134 S. Ct. at 2358).

The court also determined that "the automation goes beyond merely organizing existing information into a new form or carrying out a fundamental economic practice." *Id.* at 1315 (citations and internal quotation marks omitted). Instead, the court found that "the claimed process uses a combined order of specific rules that renders information into a specific format that is then used and applied to create desired results: a sequence of synchronized, animated characters." *Id.* The court acknowledged that the result may not be tangible, but noted that "there is nothing that requires a method 'be tied to a machine or transform an article' to be patentable." *Id.* (citing *Bilski v. Kappos*, 561 U.S. at 603 (2010).

Thus, the court in *McRO* determined that the claimed genus of rules does not preempt all techniques for automating 3-D animation that rely on rules because the claim requires that the rules be rendered in a specific way. *Id.* at 1315. The court further noted the absence of a showing that any rules-based lip-synchronization process must use rules with the specifically claimed characteristics. *Id.* (stating that "the description of one set of rules

does not mean that there exists only one set of rules."). Based on the specific features recited in the claims, the court held that the claimed process was not directed to an abstract idea and that it recited patent eligible subject matter under 35 U.S.C. § 101. With these legal principles in mind, we now examine the claimed subject matter on appeal.

ANALYSIS

As the first step of our analysis, we determine whether claims 1–7, 15–21, 23, 24, and 28–33 are directed to a patent-ineligible concept, such as an abstract idea. *See Alice*, 134 S. Ct. at 2355. In determining whether the claims are directed to an abstract idea, we must avoid oversimplifying the claims because "all inventions at some level embody, use, reflect, rest upon, or apply laws of nature, natural phenomena, or abstract ideas." *Mayo*, 132 S. Ct. at 1293. To that end, we consider the claims "in light of the specification, based on whether 'their character as a whole is directed to excluded subject matter.'" *Enfish, LLC v. Microsoft Corp.*, 822 F.3d 1327, 1335–36 (Fed. Cir. 2016) (quoting *Internet Patents Corp. v. Active Network Inc.*, 790 F.3d 1343, 1346 (Fed. Cir. 2015)). In that regard, we determine whether the claims "focus on a specific means or method that improves the relevant technology" or are "directed to a result or effect that itself is the abstract idea and merely invoke generic processes and machinery." *McRO, Inc.*, 837 F.3d at 1314.

Background

Appellant's Specification describes that prior art attempts at using SAR and IFSAR to measure and characterize sea ice have used satellite-based X-band systems or airborne systems to map the top of ice through a few decimeters of dry snow and characterize only new from

first-year and multiyear ice. Spec. ¶ 9. Such systems do not measure ice thickness. *Id.* The Specification describes that in the art at the time of Appellant's invention, ice thickness measurements were typically acquired using low flying profiling radar systems or using on-ice tools, such as sled-based ground penetrating radar and drilling core samples. *Id.* ¶ 10. These measuring techniques provided data coverage over very small areas. *Id.*

Claimed Subject Matter

Several of Appellant's claims are directed to using SAR data acquired via a SAR system, where the SAR data includes X-band data and P-band data. *Id.* ¶ 11. The X-band SAR provides details of surface features including surface snow and surface clutter, while the P-band SAR penetrates the surface features and the ice itself to reveal details of surface and internal cracking of an ice floe not evident in X-band data. *Id.* ¶¶ 31–34. The dual frequency data also can be used to provide ice thickness estimates and to characterize sea ice into new, first, and multiyear ice. *Id.* ¶¶ 13, 18, 41.

Specifically, independent claims 1 and 15 recite acquiring full polarity SAR data, via a SAR system, over an area containing sea ice, where the full polarity SAR data includes X-band data and P-band data, generating layers based on the dual frequency data, registering the generated layers one to another geographically, and combining the generated layers to determine a depth of the sea ice. Appeal Br. 17, 20 (Claims Appendix). The Specification describes, with reference to Figure 4, the specific steps the processor employs to determine the thickness of the ice based on the X-band and P-band SAR data. Spec. ¶ 46, Fig. 4. This process includes, for example, creating elevation models for the top of the ice based on the

X-band digital elevation map, creating elevation models for the penetration depth based on the P-band HH digital elevation map, and subtracting these models to provide a direct measure of ice thickness. *Id.*

Independent claims 23 and 24 recite obtaining or receiving co-polarized (i.e., VV) X-band SAR data and co-polarized (i.e., HH and VV) P-band SAR data of an ice floe from a SAR system, performing interferometric processing on the data, pixel registering the data to one another, creating specific maps with the data, clustering the dark and bright pixels based on the maps, and performing rules-based processing of the clustered pixel data to determine the presence of leads[4] in the ice floe. Appeal Br. 23–24 (Claims Appendix). The Specification describes, with reference to Figures 5A and 5B, that detection of open water and refrozen ice leads is performed by region clustering of dark pixels and region clustering of bright pixels in the X-band imagery, and similar region clustering of dark and bright pixels in the P-band imagery, followed by a rule-based lead detection algorithm. Spec. ¶ 76, Figs. 5A, 5B. In particular, the Specification explains that for noteworthy clusters, which are defined as cluster areas above a certain area and with a suitable aspect ratio, open water leads that have not refrozen are identified as those clusters having dark pixel clusters in both the X-band and P-band, and refrozen leads are identified as those clusters having bright pixel clusters in the X-band and dark pixel clusters in the P-band. *Id.*

[4] According to the Specification, "[a] lead differs from a crack since it represents a physical separation through the vertical extent of the ice." Spec. ¶ 75.

Other of Appellant's claims are directed to using co-polarized (i.e., HH and VV) P-band SAR data acquired via a SAR system data to map ice structures and weak points in the ice floe. Spec. ¶¶ 5–6, 19, 33–34, 69, 77. Specifically, independent claims 28 and 31 recite obtaining or receiving P-band HH SAR data and P-band VV SAR data of an ice floe, performing interferometric processing on the data, pixel registering the data to one another, creating radar magnitude maps for the data, identifying and assigning candidate pixels from the maps to crack segments, and applying a joining algorithm to the crack segments to form an identified ice crack. Appeal Br. 25, 26 (Claims Appendix). The Specification describes, with reference to Figure 6, using P-band SAR data, and specifically P-band MAG imagery, to identify cracks. Spec. ¶ 69, Fig. 6. The Specification explains that candidate pixels for inclusion in a crack are identified as adjacent pixels with linear organization that are distinguished from surrounding pixels by their amplitude. *Id.* The Specification describes that typically, an ice crack is identified as a higher amplitude pixel than would be recorded from ice that had no cracks. *Id.* ¶ 70. Short chains of these identified pixels represent an ice crack. *Id.* A joining algorithm is used to connect these short chains of cracks into longer chains to identify a contiguous crack in the ice. *Id.* ¶ 71. As explained above, although the processing of the SAR data recited in the limitations of these claims is a form of data processing, the claim limitations amount to specific formatting of the data according to rules to identify ice cracks.

The claimed improvement in each of the claims is allowing the processor of a SAR system to determine ice thickness, leads in the ice, and ice cracks, each of which requires data taken from below the ice surface, that

previously could only be produced over very small areas using low-flying profiling radar systems, sled-based ground penetrating radar, or core samples drilled from the ice. Spec. ¶ 10. These characterizations of the sea ice are realized by improving the prior art using specific rules to combine and process dual-frequency SAR data and using specific rules to process particular types of P-band SAR data.

Mere Automation of a Past Manual Activity

We disagree with the Examiner's finding that the claims are not a technical improvement over existing manual techniques because they do not evaluate the data in a manner that is different from past manual techniques. Ans. 4. We have insufficient evidence in the record before us to support a determination that the claimed subject matter is simply use of a computer as a tool to automate conventional activity.

Although it is generally known to use interferometric SARs emitting energy in the X-band to map the surface of an ice floe (Spec. ¶ 9), the Examiner has not shown that the process steps recited in the rejected independent claims are merely automation of past manual activity. Ans. 6. The record before us does not contain sufficient evidence to show that the claimed process is the same as any prior art process used to determine the claimed sea ice characteristics. There is nothing in the discussion of the background of the invention in Appellant's Specification that would support the Examiner's finding. The Examiner has not directed us, for example, to any prior art manual processes for characterizing sea ice that use the claimed P-band SAR data. Unlike *Flook*, *Bilski*, and *Alice*, where the claimed computer-automated process and the prior method were carried out the same way, the processor in the claimed SAR system appears to perform a distinct

process to characterize the sea ice. *Parker v. Flook*, 437 U.S. 584, 585–86 (1978); *Bilski*, 561 U.S. at 611; *Alice*, 134 S. Ct. at 2356.

Mathematical Algorithms

The Examiner also characterized the claims as reciting "merely a series of mathematical or logical operations that determines the depth of sea ice after merely generically gathering data used in the operation." Ans. 2. We acknowledge that the last limitation in claims 1 and 15, reciting determining a measure of ice thickness, involves a mathematical calculation. Spec. ¶ 46. The process steps of these claims are not limited, however, to this calculation. Instead, the claimed operations also recite obtaining specific full polarity X-band and P-band SAR data, processing the acquired data to build layers of a map, and registering the layers together to create a depth map prior to calculating the ice thickness. Likewise, although the processing of the SAR data recited in claims 23, 24, 28, and 31 is a form of data processing, the claim limitations amount to specific formatting of the data according to rules to identify leads and cracks in the ice. Thus, the claim limitations recite a combined order of specific rules that renders information into a specific format that is then used and applied to characterize the sea ice.

We acknowledge that the claimed result is not tangible. As noted by the Court in *McRO*, although the result might not be tangible, "[t]he concern underlying the exceptions to § 101 is not tangibility, but preemption." *McRO*, 837 F.3d at 1315 (citing *Mayo*, 132 S. Ct. at 1301). As discussed below, we have insufficient evidence that the recited steps preempt all methods of achieving the claimed results. Rather, based on the evidence

before us, the claimed steps appear to recite improvements to prior processes of achieving the claimed results.

Preemption

The Examiner also characterizes the steps of the claims as "performed on a generically recited processor or system using generic computer operations." Ans. 5; *see also* Final Act. 13–14 (characterizing the steps as "calculations being done on a computer processor"). We disagree with this characterization.

The recitation of an abstract idea performed on a generic processor using generic computer operations raises preemption concerns in that such a claim, if issued, might preempt all aspects of the abstract idea because "it matters not by what process or machinery the result is accomplished." *O'Reilly v. Morse*, 56 U.S. 62, 113 (1854). As to generic computer operations, the Federal Circuit recently explained that the "realm of abstract ideas" includes collecting information, including when limited to particular content, analyzing information by steps people go through in their minds, or by mathematical algorithms, without more, and presenting the results of abstract processes of collecting and analyzing information, without more. *FairWarning IP, LLC v. Iatric Systems, Inc.*, 839 F.3d 1089, 1094–95 (Fed. Cir. 2016) (citations omitted) (affirming a district court determination that claims directed to a computer-implemented process for detecting improper access of a patient's protected health information using rules implementing past manual activity was not patent eligible). The Court in *FairWarning*, distinguished its holding from the outcome in *McRO*, explaining that in *McRO* "the traditional process and newly claimed method stood in contrast" and that "the two practices produced those results in fundamentally different

ways." *Id.* at 1094. As was explained in *McRO,* "it [was] the incorporation of the claimed rules, not the use of the computer that 'improved [the] existing technological process' by allowing the automation of further tasks." *McRO*, 837 F.3d at 1313 (alteration in original) (quoting *Alice*, 134 S. Ct. at 2358). By contrast, "FairWarning's claims merely implement an old practice in a new environment" using "the same questions . . . that humans in analogous situations detecting fraud have asked for decades, if not centuries." *FairWarning*, 839 F.3d 1094–95. The Court explained, "Although FairWarning's claims require the use of a computer, it is this incorporation of a computer, *not* the claimed rule, that purportedly 'improve[s] [the] existing technological process' by allowing the automation of further tasks." *Id.* at 1095 (quoting *Alice*, 134 S. Ct. at 2358).

Here, the claims recite computer operations that are not generic. As explained above, the claimed steps are not limited to analyzing information by mathematical algorithms. Further, it does not appear, and we lack adequate evidence to support a finding, that the claims on appeal merely implement an old practice in a new environment or otherwise analyze information by steps people go through in their minds. Rather, it appears from the evidence before us that the claimed process steps produce characterizations of sea ice in fundamentally different ways from prior practices. Further, a preponderance of the evidence does not support a finding that all determinations of the sea ice characteristics recited in each of the rejected independent claims must employ the steps recited in their respective claims.

Conclusion

When looking at the specific requirements of the claims as an ordered combination, we find that the claims are limited to rules with specific characteristics that amount to an improvement to an existing technological process. The Examiner erred in oversimplifying the claims and characterizing them as directed to generic computer operations, mathematical algorithms, and mere automation of prior manual activity. The claimed subject matter is limited to a technological solution to a technical problem. In other words, the algorithms recited in each of independent claims 1, 15, 23, 24, 28, and 31 are the improvement on the technology. For these reasons, the claims on appeal are not directed to an abstract idea. Accordingly, we do not sustain the rejection of claims 1–7, 15–21, 23, 24, and 28–33 under 35 U.S.C. § 101.

DECISION

The decision of the Examiner rejecting claims 1–7, 15–21, 23, 24, and 28–33 is reversed.

REVERSED