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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* DANIEL N. LIU

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Appeal 2018-000930  
Application 14/605,377<sup>1</sup>  
Technology Center 2100

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Before MAHSHID D. SAADAT, ALLEN R. MacDONALD, and  
JOHN P. PINKERTON, *Administrative Patent Judges*.

PINKERTON, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellant appeals under 35 U.S.C. § 134(a) from the Examiner's Final Rejection of claims 1–13, which constitute all the claims pending in this application. Claims 14–20 were withdrawn from consideration. We have jurisdiction under 35 U.S.C. § 6(b).

We affirm.

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<sup>1</sup> The real party in interest identified by Appellant is Northrop Grumman Systems Corporation. App. Br. 3.

## STATEMENT OF THE CASE

### *Introduction*

Appellant's described and claimed invention relates generally to signal equalization and more particularly, to equalization of bandwidth-efficient modulation signals in a direct point to point downlink channel broadcasting from a satellite to earth using an iterative equalizer to incorporate non-linear models into computation of trellis branch metrics. *See Spec.* ¶ 12.<sup>2</sup>

Claim 1 is representative and reads as follows:

1. A method for trellis-based sequence estimation using the algorithm by Bahl, Cocke, Jelinek, and Raviv (BCJR), comprising:

generating a trellis;

generating one or more predicted symbols using a first non-linear model;

computing and saving two or more branch metrics using a priori log-likelihood ratio (LLR) information, a channel observation, and one or more of the one or more predicted symbols;

if alpha forward recursion has not yet completed, generating two or more alpha forward recursion state metrics using a second non-linear model;

if beta backward recursion has not yet completed, generating two or more beta backward recursion state metrics using a third non-linear model;

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<sup>2</sup> Our Decision refers to the Final Office Action mailed August 30, 2016 ("Final Act."), Appellant's Appeal Brief filed January 12, 2017 ("App. Br.") and Reply Brief filed July 12, 2017 ("Reply Br."), the Examiner's Answer mailed July 7, 2017, and the original Specification filed January 26, 2015 ("Spec.").

if sigma forward recursion has not yet completed, generating two or more sigma forward recursion state metrics using the two or more branch metrics, the two or more alpha state metrics, and the two or more beta backward recursion state metrics, to estimate a sequence for the trellis;

generating extrinsic information comprising a difference of a posteriori LLR information and the a priori LLR information;

computing and feeding back the a priori LLR information;

and

calculating the a posteriori LLR information.

App. Br. 16 (Claims App.).

### *Rejections on Appeal*<sup>3</sup>

Claims 1–13 stand rejected under 35 U.S.C. § 112(b) as failing to set forth the subject matter which the inventor regards as the invention.

Claims 1–13 stand rejected under 35 U.S.C. § 101 because the claimed invention is directed to a judicial exception (i.e., an abstract idea) without significantly more.

### ANALYSIS

#### *Rejection of Claims 1–13 under § 112(b)*

The Examiner finds:

Evidence that claims 1-13 fail(s) to correspond in scope with that which the inventor . . . regard as the invention can be found in the reply filed 08/18/2016. In that paper, the inventor or a joint inventor, or for pre-AIA the applicant has stated “In fact, the

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<sup>3</sup> Appellant argues claims 1–13 as a group, focusing on claim 1. *See* App. Br. 15. We consider claim 1 to be representative of the claimed subject matter on appeal and, therefore, we decide the rejection of claims 1–13 on the basis of representative claim 1. *See* 37 C.F.R. § 41.37(c)(1)(iv).

claims require a computer that *performs functions that are so far from being well-understood*, routine and conventional that they have never been anticipated nor rendered obvious by any patent or patent application or combination thereof”, and this statement indicates that the invention is different from what is defined in the claim(s) because language that is “*so far from being well-understood*” fails to particular point out and distinctly claim the subject matter which the applicant regards as his invention by convincingly [sic] performing functions as recited in the claim.

Final Act. 4–5 (Examiner’s emphasis added); *see also* Ans. 3.

Appellant argues “independent claim 1 does not fail to set forth the subject matter which the inventor . . . [regards] as their invention” as the claim recites “all the highly specific recitations” described in Appellant’s Appeal Brief. *See* App. Br. 7. Appellant further argues that Appellant’s Response to the Office Action dated August 18, 2016 (“Response”), arguing that the claims recited functions that are not “well-understood, routine, and conventional,” did not provide any evidence that the claims fail to set forth the subject matter which the inventor regards as the invention. *See* App. Br. 7–8.

We are persuaded the Examiner erred in rejecting claim 1 under 35 U.S.C. § 112(b). We agree with Appellant that the remarks in the Response did not provide evidence that claim 1 fails to set forth the subject matter which the inventor regards as the invention.

Accordingly, on this record, we do not sustain the Examiner’s rejection of claim 1 for failing to set forth the subject matter which the inventor regards as the invention under 35 U.S.C. § 112(b). We also do not sustain the Examiner’s rejection of claims 2–13, which depend from claim 1.

*Rejection of Claims 1–13 under § 101*

Applicable Law

Under 35 U.S.C. § 101, an invention is patent-eligible if it claims a “new and useful process, machine, manufacture, or composition of matter.” 35 U.S.C. § 101. The Supreme Court, however, has long interpreted § 101 to include an implicit exception: “Laws of nature, natural phenomena, and abstract ideas” are not patentable. *See, e.g., Alice Corp. Pty. v. CLS Bank Int’l*, 134 S. Ct. 2347, 2354 (2014) (internal quotation marks and citation omitted).

The Supreme Court, in *Alice*, reiterated the two-step framework previously set forth in *Mayo Collaborative Services v. Prometheus Laboratories, Inc.*, 566 U.S. 66, 75–77 (2012), “for distinguishing patents that claim laws of nature, natural phenomena, and abstract ideas from those that claim patent-eligible applications of those 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.* For example, abstract ideas include, but are not limited to, fundamental economic practices, methods of organizing human activities, an idea of itself, and mathematical formulas or relationships. *Id.* at 2355–57. The “directed to” inquiry asks not whether “the claims *involve* a patent-ineligible concept,” but instead whether, “considered in light of the specification, . . . ‘their character as a whole is directed to excluded subject matter.’” *Enfish, LLC v. Microsoft Corp.*, 822 F.3d 1327, 1335 (Fed. Cir. 2016) (internal citations omitted). 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. v. Bandai Namco Games Am. Inc.*, 837 F.3d 1299, 1314 (Fed. Cir. 2016) (citation omitted).

If, at the first stage of the *Alice* analysis, we conclude that the claim is not directed to a patent-ineligible concept, it is considered patent eligible under § 101 and the inquiry ends. *Rapid Litig. Mgmt. Ltd. v. CellzDirect, Inc.*, 827 F.3d 1042, 1047 (Fed. Cir. 2016).

If the claims are directed to a patent-ineligible concept, 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, 78). In other words, the second step is to “search for an “‘inventive concept’”—*i.e.*, an element or combination of elements that is ‘sufficient to ensure that the patent in practice amounts to significantly more than a patent upon the [ineligible concept] itself.’” *Id.* (brackets in original) (quoting *Mayo*, 566 U.S. at 72–73). The prohibition against patenting an abstract idea “‘cannot be circumvented by attempting to limit the use of the formula to a particular technological environment’ or adding ‘insignificant post solution activity.’” *Bilski v. Kappos*, 561 U.S. 593, 610–11 (2010) (quoting *Diamond v. Diehr*, 450 U.S. 175, 191–92 (1981)).

#### Appellant’s Arguments

Appellant fails to concede that the claims are directed to an abstract idea. *See* App. Br. 14. Even assuming *arguendo* that the claims are directed to an abstract idea, Appellant contends the claims comprise “limitations, [that] when taken as an ordered combination, provide unconventional steps that confine the [alleged] abstract idea to a particular useful application.” *Id.*

As argued by Appellant, the claims allow the “actual construction of [high-speed], wide-band, high-performing satellite communication demodulators capable of operating near a theoretical performance limit,” and, thus, the claims recite a “new and significant invention that is an advancement over the prior art.” *Id.* at 13; *see also* Reply Br. 7.

Step One of Alice

The Examiner finds the claims are directed to the abstract idea of “trellis-based sequence estimation using the algorithm by Bahl, Cocke, Jelinek, and Raviv (BCJR).” *See* Final Act. 5. Regarding claim 1, the preamble recites “[a] method for trellis-based sequence estimation using the algorithm by Bahl, Cocke, Jelinek, and Raviv (BCJR).” Claim 1 further recites the steps of: (1) generating a trellis; (2) generating predicated symbols using a first non-linear model; (3) computing and saving branch metrics using a priori log-likelihood ratio (LLR) information, a channel observation, and the predicted symbols; (4) generating alpha forward recursion state metrics using a second non-linear model if alpha forward recursion has not yet completed; (5) generating beta backward recursion state metrics using a third non-linear model if beta backward recursion has not yet completed; (6) generating sigma forward recursion state metrics using branch metrics, the alpha state metrics, the beta backward recursion state metrics, to estimate a sequence for the trellis if sigma forward recursion has not yet completed; (7) generating extrinsic information comprising a difference of a posteriori LLR information and the a priori LLR information; (8) computing and feeding back the a priori LLR information; and (9) calculating the a posteriori LLR information. These steps define an

algorithm generating a trellis-based data structure that is utilized in trellis-based sequence estimation.

Considering the focus of claim 1 as a whole, we agree with the Examiner that claim 1 is directed to an abstract idea (i.e., a mathematical algorithm for estimating a sequence of symbols utilizing a generated trellis data structure). The Supreme Court has concluded “if a claim is directed essentially to a method of calculating, using a mathematical formula, even if the solution is for a specific purpose, the claimed method is [patent-ineligible subject matter].” *Parker v. Flook*, 437 U.S. 584, 595 (1978) (quoting *In re Richman*, 563 F.2d 1026, 1030 (CCPA 1977)). Additionally, our reviewing court has concluded, absent additional limitations, “a process that employs mathematical algorithms to manipulate existing information to generate additional information is not patent eligible.” *Digitech Image Techs., LLC v. Elecs. for Imaging, Inc.*, 758 F.3d 1344, 1351 (Fed. Cir. 2014). Further, “analyzing information by steps people go through in their minds, or by mathematical algorithms, without more, [are] essentially mental processes within the abstract-idea category.” *Elec. Power Grp., LLC v. Alstom*, 830 F.3d 1350, 1354 (Fed. Cir. 2016); *see also Synopsys, Inc. v. Mentor Graphics Corp.*, 839 F.3d 1138, 1146 (Fed. Cir. 2016). “[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.” *Bancorp Servs., L.L.C. v. Sun Life Assurance Co. of Can. (U.S.)*, 687 F.3d 1266, 1278 (Fed. Cir. 2012).

In particular, we note that the various “generating” steps, and the “computing” and “calculating” steps, recited in claim 1 could be performed by a human with pen and paper, as claim 1 fails to recite that the steps are

performed by a computer or any other type of machine. “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*.” *CyberSource Corp. v. Retail Decisions, Inc.*, 654 F.3d 1366, 1375 (Fed. Cir. 2011).

Further, merely combining several abstract ideas do not render the combination any less abstract. *RecogniCorp, LLC v. Nintendo Co., Ltd.*, 855 F.3d 1322, 1327 (Fed. Cir. 2017) (“Adding one abstract idea . . . to another abstract idea . . . does not render the claim non-abstract.”); *see also FairWarning IP, LLC v. Iatric Sys., Inc.*, 839 F.3d 1089, 1094 (Fed. Cir. 2016) (determining the pending claims were directed to a combination of abstract ideas).

We disagree with Appellant’s contention that the claims are directed to a specific implementation of a solution to a problem in the software arts, similar to the claims at-issue in *Enfish*, rather than a mathematical algorithm. *See* App. Br. 10–14. Although Appellant argues embodiments of the invention result in construction of communication demodulators capable of operating at an optimal performance, with savings of 3–4 decibels on communications (*see id.* at 13; *see also* Spec. ¶¶ 62–66), claim 1 fails to recite the technical details that describe how a satellite communication system realizes the operational improvement via the claimed algorithm. Thus, contrary to Appellant’s assertion, the claim fails to recite the improvement to the field of satellite communication systems that Appellant argues the claim is directed to.

Step Two of *Alice*

Regarding step two of the *Alice* analysis, the Examiner finds the claims do not include additional elements that are sufficient to amount to significantly more than an abstract idea because all claimed elements are “strictly in support of the abstract algorithm”. *See* Final Act. 5. The Examiner further finds that an inventive concept is not evident in the claims as required under step two of the *Alice* inquiry. *See* Ans. 3–7.

We agree with the Examiner’s findings, and we are not persuaded by Appellant’s contentions. Regarding Appellant’s argument that the elements of claim 1 are “so far from being ‘well-understood’” because “they have never been anticipated nor rendered obvious” (*see* App. Br. 14–15), a finding of novelty or non-obviousness does not automatically lead to the conclusion that the claimed subject matter is patent-eligible. Although the second step in the *Mayo/Alice* framework is termed a search for an “inventive concept,” the analysis is not an evaluation of novelty or non-obviousness, but rather, a search for “an element or combination of elements that is ‘sufficient to ensure that the patent in practice amounts to significantly more than a patent upon the [ineligible concept] itself.’” *Alice Corp.*, 134 S. Ct. at 2355 (quoting *Mayo*, 566 U.S. at 72–73). “Groundbreaking, innovative, or even brilliant discovery does not by itself satisfy the § 101 inquiry.” *Ass’n for Molecular Pathology v. Myriad Genetics, Inc.*, 569 U.S. 576, 591 (2013). A novel and non-obvious claim directed to a purely abstract idea is, nonetheless, patent-ineligible. *See Mayo*, 566 U.S. at 90; *see also Diamond v. Diehr*, 450 U.S. 175, 188–89 (1981) (“The ‘novelty’ of any element or steps in a process, or even of the process itself, is of no relevance in determining whether the subject matter of

a claim falls within the § 101 categories of possibly patentable subject matter”).

Regarding Appellant’s argument that the claim elements, when considered in combination and in light of Appellant’s Specification, are directed to an innovative concept (*see* App. Br. 8–10), as previously described, claim 1 fails to recite the technical details that describe how a satellite communication system realizes the performance improvement via the claimed algorithm. Claim 1 does not “focus on a specific means or method that improves the relevant technology,” but is “directed to a result or effect that itself is the abstract idea and merely invoke[s] generic processes and machinery.” *McRO*, 837 F.3d at 1314. This is not enough to transform an abstract idea into patent-eligible subject matter. *See, e.g., Alice*, 134 S. Ct. at 2360 (explaining that claims that “amount to ‘nothing significantly more’ than an instruction to apply the abstract idea . . . using some unspecified, generic computer” “is not ‘enough’ to transform an abstract idea into a patent-eligible invention” (quoting *Mayo*, 566 U.S. at 77, 79)); *Intellectual Ventures I LLC v. Capital One Fin. Corp.*, 850 F.3d 1332, 1342 (Fed. Cir. 2016) (“[T]he claim language here provides only a result-oriented solution, with insufficient detail for how a computer accomplishes it”).

Accordingly, for the reasons discussed above, we sustain the Examiner’s rejection of claim 1 under 35 U.S.C. § 101. For the same reasons, we sustain the rejection of dependent claims 2–13, which are not separately argued, under 35 U.S.C. § 101.

Appeal 2018-000930  
Application 14/605,377

DECISION

We reverse the Examiner's rejection of claims 1–13 under 35 U.S.C. § 112(b).

We affirm the Examiner's rejection of claims 1–13 under 35 U.S.C. § 101.

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