UNITED STATES PATENT AND TRADEMARK OFFICE

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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte KRISHNAN SURESH and JOSHUA DANCZYK

Appeal 2018-003916
Application 13/828,673[1]
Technology Center 2100

Before ALLEN R. MacDONALD, HUNG H. BUI, and
MICHAEL M. BARRY, *Administrative Patent Judges*.

BUI, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellants seek our review under 35 U.S.C. § 134(a) from the
Examiner's Final Rejection of claims 1–12 and 14–23, which are all the
claims pending in the application. Claim 13 is cancelled. App. Br. 10–15
(Claims App'x). We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.[2]

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[1] According to Appellants, Wisconsin Alumni Research Foundation is the
real party in interest. App. Br. 3.
[2] Our Decision refers to Appellants' Appeal Brief filed November 10, 2017
("App. Br."); Reply Brief filed February 28, 2018 ("Reply Br."); Examiner's
Answer mailed December 29, 2017 ("Ans."); Final Office Action mailed
November 7, 2016 ("Final Act."); and original Specification filed March 14,
2013 ("Spec.").

STATEMENT OF THE CASE

Finite element analysis (FEA) is a computerized method used by engineers and designers used to design new products or refine existing products. Spec. 1:8–11. For example, a user is able to verify if a proposed design of a product will perform in accordance with desired specification prior to manufacturing, or to predict how a product reacts to real-world forces, vibration, heat, fluid flow, and other physical effects. Spec. 1:11–14.

According to Appellants, "the geometry of the proposed design is identified" and "is broken up into a discrete representation, known as a mesh . . . made up of a plurality of finite elements." Spec. 1:14–16. However, "none of the [finite] elements must overlap, i.e., the mesh must not be tangled," but "the tangling of a finite element mesh is unavoidable in modern FEA." Spec. 1:23–27. As such, Appellants "provide a method for carrying accurate finite element analysis over a tangled mesh which allows a user to generate physically valid solutions to the equations governing a proposed design." Spec. 2:16–18.

Claims 1 and 14 are independent. Claim 1 is illustrative of the claimed subject matter, as reproduced below:

1.   A method for carrying out accurate finite element analysis on a proposed product design, the proposed product design having desired specifications, comprising the steps of:
        defining a domain of the proposed product design;
        meshing the domain of the proposed product design, the mesh being defined by a plurality of finite elements;
        computing a stiffness contribution due to the plurality of finite elements;
        computing a stiffness contribution due to the finite elements overlapping finite elements;

combining the stiffness contribution of the plurality of
finite elements and the stiffness contribution due to the
overlapping finite elements;
applying user selected boundary conditions to the mesh;
calculating an effect of the boundary conditions on the
plurality of finite elements; and
verifying the proposed product design will perform in
accordance with the desired specifications in response to the
effect.

App. Br. 10 (Claims App'x).

EXAMINER'S REJECTION

Claims 1–12 and 14–23 stand rejected under 35 U.S.C. § 101 because
the claimed invention is directed to a patent-ineligible "abstract idea"
without significantly more. Final Act. 5–9.

DISCUSSION

To determine whether subject matter is patent-eligible under § 101,
the Supreme Court has set forth a two part test "for distinguishing patents
that claim laws of nature, natural phenomena, and abstract ideas from those
that claim patent-eligible applications of those concepts." *Alice Corp. Pty. v.
CLS Bank Int'l*, 134 S. Ct. 2347, 2355 (2014). The first step in the analysis
is to "determine whether the claims at issue are directed to one of those
patent-ineligible concepts," such as an abstract idea. *Id.* For computer-
related technologies, "the first step in the *Alice* inquiry . . . asks whether the
focus of the claims is on the *specific asserted improvement* in computer
capabilities" (which would be eligible subject matter) or instead "on a
process that qualifies as an 'abstract idea' for which *computers are invoked*

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merely as a tool" (which would be ineligible subject matter). *Enfish, LLC v. Microsoft Corp.*, 822 F.3d 1327, 1335–36, 1338 (Fed. Cir. 2016) (emphasis added). If the claims are directed to eligible subject matter, the inquiry ends. *Id.* at 1339.

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 (citing *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.* (citing *Mayo*, 566 U.S. at 72–73).

In rejecting claims 1–12 and 14–23 under 35 U.S.C. § 101, the Examiner determines these claims are directed to an abstract idea, i.e., "an algorithm for verification of a proposed product design" and contain "mathematical manipulations of an abstraction [i.e., a mesh that has been subjected to a Finite Element Analysis]" without any "real-world" application. Final Act. 5; Ans. 3–4. The Examiner also determines these claims are directed to an abstract idea because the process recited in these claims can be implemented mentally or performed manually by a human with pen and paper. Final Act. 6; *see also CyberSource Corp. v. Retail Decisions, Inc.*, 654 F.3d 1366, 1372 (Fed. Cir. 2011). The Examiner further determines additional elements in the claims, whether taken separately or in an ordered combination, do not amount to "significantly more" than an abstract idea, because Appellants' claims only recite an

algorithm, i.e., "mathematical manipulations of an abstraction" and do not suggest any "real-world" application of the claimed "algorithm." Final Act. 8–9.

Alice/Mayo—Step 1 (Abstract Idea)

Turning to the first step of the *Alice* inquiry, Appellants argue the claims are not directed to an abstract idea because (1) "the steps in the methodology provided in the independent claims are sufficient concrete as to set them outside the broad definition of an abstract idea, as set forth in *Alice*," and (2) the claims are analogous or similar to those discussed in *Ex Parte Wegman*, Appeal No. 2013-008168 (PTAB September 22, 2015) where "the Board determined that the steps directed toward '. . . performing an analysis of objects, *either actual or virtual,* and calculating coefficients for the model based upon that analysis . . . are sufficiently concrete as to set them outside the broad definition of abstract idea as set forth in *Alice*." App. Br. 5–6.

Appellants' arguments are not persuasive. First, Appellants' reliance on *Ex Parte Wegman* is misplaced. Non-precedential Board decisions including *Ex Parte Wegman* are not binding, and those decisions are highly fact-specific to those cases.

Second, the appropriate authority for this case is *Gottschalk v. Benson*, 409 U.S. 63 (1972) where the Supreme Court held *Benson's* process claim of converting signals from binary coded decimal "BCD" form into binary, via a series of mathematical calculations to be an "abstract idea" under 35 U.S.C. § 101. For example, *Benson's* claim recites "a method of converting signals from binary coded decimal form into binary which comprises the steps of:

(1)   storing the binary coded decimal signals in a reentrant shift register,

(2)   shifting the signals to the right by at least three places, until there is a binary '1' in the second position of said register,

(3)   masking out said binary '1' in said second position of said register,

(4)   adding a binary '1' to the first position of said register,

(5)   shifting the signals to the left by two positions,

(6)   adding a '1' to said first position, and

(7)   shifting the signals to the right by at least three positions in preparation for a succeeding binary '1' in the second position of said register."

As shown in *Benson's* claim, the process of converting BCD numerals into pure binary numerals is an "algorithm" including a series of mathematical calculations without a particular practical application. Fittingly, the Supreme Court held *Benson's* process claim to be an impermissible "abstract idea" because it was "so abstract and sweeping as to cover both known and unknown use" of such an "algorithm" with or without a computer. *Id.* at 65–68. The Supreme Court also observed that the conversion of BCD numerals to pure binary numerals can be done mentally, using a mathematical table. *Id.* at 67.

Similar to *Benson*, Appellants' claims 1 and 14 are directed to an abstract idea of "carrying out accurate finite element analysis on a proposed product design," i.e., "an algorithm for verification of a proposed product design," and contain a series of mathematical calculations, including, for example, (1) "computing a stiffness contribution due to the plurality of finite elements [in a mesh];" (2) "computing a stiffness contribution due to the finite elements overlapping finite elements;" (3) "combining the stiffness

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contribution of the plurality of finite elements and the stiffness contribution due to the overlapping finite elements;" (4) "applying user selected boundary conditions to the mesh;" (5) "calculating an effect of the boundary conditions on the plurality of finite elements;" and (6) "verifying the proposed product design will perform in accordance with the desired specifications."

Information, as such, is intangible, and data analysis and algorithms are also abstract ideas. *See, e.g.*, *Microsoft Corp. v. AT & T Corp.*, 550 U.S. 437, 451 n.12 (2007); *Alice*, 134 S.Ct. at 2355; *Parker v. Flook*, 437 U.S. 584, 589, 594–95 (1978) ("Reasoning that an algorithm, or mathematical formula, is like a law of nature, *Benson* applied the established rule that a law of nature cannot be the subject of a patent."); and *Benson*, 409 U.S. at 71–72. "[C]ollecting information, including when limited to particular content (which does not change its character as information)," and "analyzing information by steps people go through in their minds, or by mathematical algorithms, without more," are "within the realm of abstract ideas." *Electric Power*, 830 F.3d at 1353–54; *see also Internet Patents Corp. v. Active Network, Inc.*, 790 F.3d 1343, 1349 (Fed. Cir. 2015); *Digitech Image Technologies, LLC v. Electronics for Imaging, Inc.*, 758 F.3d 1344, 1351 (Fed. Cir. 2014); *CyberSource*, 654 F.3d at 1370. That is, "[w]ithout additional limitations, a process that employs mathematical algorithms to manipulate existing information to generate additional information is not patent eligible." *Digitech*, 758 F.3d at 1349–50 ("Data in its ethereal, non-physical form is simply information that does not fall under any of the categories of eligible subject matter under section 101.").

As further recognized by the Examiner (Final Act. 6), the steps recited in Appellants' claims 1 and 14 are also mental steps that could be performed in the human mind or by a human using a pen and paper. *See CyberSource*, 654 F.3d at 1372–73 ("[A] method that can be performed by human thought alone is merely an abstract idea and is not patent-eligible under [section] 101."); *see also In re Comiskey*, 554 F.3d 967, 979 (Fed. Cir. 2009) ("[M]ental processes—or processes of human thinking—standing alone are not patentable even if they have practical application."); *Benson*, 409 U.S. at 67 ("Phenomena of nature,[] *mental processes*, and abstract intellectual concepts are not patentable, as they are the basic tools of scientific and technological work.") (emphasis added). Additionally, mental processes remain unpatentable even when automated to reduce the burden on the user of what once could have been done with pen and paper. *CyberSource*, 654 F.3d at 1375 ("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*.").

Accordingly, we agree with the Examiner that claims 1–12 and 14–23 are directed to an abstract idea, i.e., "an algorithm for verification of a proposed product design."

Alice/Mayo—Step 2 (Inventive Concept)

In the second step of the *Alice* inquiry, Appellants argue the claims recite elements that amount to "significantly more" [i.e., inventive concept] than the alleged abstract idea" because:

> (1) Appellants' claim 1 "specifically requires performing an analysis of a virtual object (namely, applying user selected boundary conditions to the mesh of a proposed product design)" and "not only requires the calculation of the

effect of the boundary conditions on the plurality of finite elements, but further requires verifying the proposed product design will perform in accordance with the desired specification in response to that effect"; and

(2)   Similar to independent claim 1, claim 7 specifically requires performing an analysis of a virtual object (namely, applying user selected boundary conditions to the mesh of a proposed product design) and calculating coefficients for the model based upon that analysis (namely, calculating an effect of the boundary conditions on the plurality of finite elements)."

App. Br. 7–8. In the Reply, Appellants acknowledge "the pending claims do not include actual real-world elements" but argue the "claims do include a virtual object, which corresponds to a potential real-world object, being subjected to virtual collisions by various user selected boundary conditions (e.g. stress, constraints and/or loads), which represent potential real-world physical stresses on the potential real world product to verify the potential real-world object will perform as designed." Reply Br. 3.

Appellants' arguments are not persuasive. Under current Federal Circuit precedent, an "inventive concept" under *Alice* step 2 can be established by showing, for example, that the patent claims:

(1)   provide a technical solution to a technical problem unique to the Internet, e.g., a "solution . . . necessarily rooted in computer technology in order to overcome a problem specifically arising in the realm of computer networks" (*see DDR Holdings, LLC v. Hotels.com, L.P.*, 773 F.3d 1245, 1257 (Fed. Cir. 2014);

(2)   transform the abstract idea into "a particular, practical application of that abstract idea," e.g., "installation of a filtering tool at a specific location, remote from the end-users, with customizable filtering features specific to each

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end user" (*see BASCOM Global Internet Servs., Inc. v. AT&T Mobility LLC*, 827 F.3d 1341, 1352, 1350 (Fed. Cir. 2016)); or

(3)   "entail[] an unconventional technological solution ([e.g.,] enhancing data in a distributed fashion) to a technological problem ([e.g.,] massive record flows [that] previously required massive databases)" and "improve the performance of the system itself" (*see Amdocs (Israel) Ltd. v. Openet Telecom, Inc.* 841 F.3d 1288, 1300 (Fed. Cir. 2016)).

In this case, however, we find no element or combination of elements recited in Appellants' claims 1 and 14 that contains any "inventive concept" or adds anything "significantly more" to transform the abstract concept into a patent-eligible application. *Alice*, 134 S.Ct. at 2357. For example, Appellants' abstract idea of "carrying out accurate finite element analysis" is not rooted in computer technology; nor does it (1) provide any technical solution to a technical problem unique to the Internet as required by *DDR Holdings*; (2) provide any particular practical application as required by *Bascom*; or (3) entail an unconventional technological solution to a technological problem as required by *Amdocs*. As correctly recognized by the Examiner, "the claims are silent as to the actual real-world elements [i.e., a computer]" and "all of the claimed steps are either generating models or performing computations on the models." Ans. 4. Even if generic computer elements such as a computer system or processor were to be included in the claims, such generic computer limitations do not transform an otherwise abstract idea into patent-eligible subject matter. *See DDR*, 773 F.3d at 1256 (citing *Alice*, 134 S.Ct. at 2358).

Because Appellants' claims 1 and 14 are directed to a patent-ineligible abstract concept and do not recite something "significantly more" under the second prong of the *Alice* analysis, we sustain the Examiner's rejection of claims 1–12 and 14–23 under 35 U.S.C. § 101.

CONCLUSION

On the record before us, we conclude Appellants have not demonstrated the Examiner erred in rejecting claims 1–12 and 14–23 under 35 U.S.C. § 101.

DECISION

As such, we AFFIRM the Examiner's rejections of claims 1–12 and 14–23 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