UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 13/932,800 | 07/01/2013 | PHILIP W. KITCHENSIDE | IS11.0384-US-NP | 6615 |

28116 7590 07/20/2018

WesternGeco L.L.C.
10001 Richmond Avenue
IP Administration Center of Excellence
Houston, TX 77042

| EXAMINER |
|---|
| ARMSTRONG, JONATHAN D |

| ART UNIT | PAPER NUMBER |
|---|---|
| 3645 | |

| NOTIFICATION DATE | DELIVERY MODE |
|---|---|
| 07/20/2018 | ELECTRONIC |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

USDocketing@slb.com
jalverson@slb.com
SMarckesoni@slb.com

UNITED STATES PATENT AND TRADEMARK OFFICE

---

BEFORE THE PATENT TRIAL AND APPEAL BOARD

---

*Ex parte* PHILIP W. KITCHENSIDE
and PHILLIPPE CAPRIOLI[1]

---

Appeal 2017-009607
Application 13/932,800
Technology Center 3600

---

Before EDWARD A. BROWN, JAMES P. CALVE, and JILL D. HILL, *Administrative Patent Judges*.

CALVE, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Appellants appeal under 35 U.S.C. § 134(a) from the Final Office Action rejecting claims 1, 2, 5–17, and 19. Br. 1. Claims 3, 4, and 18 are cancelled. *Id.* at 21–24 (Claims App'x). We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.

---

[1] Schlumberger Technology Corporation is identified as the real party in interest. Br. 4.

## CLAIMED SUBJECT MATTER

Claims 1, 17, and 19 are independent. Claim 1 is reproduced below.

> 1. A method for deghosting marine seismic data, comprising:
>
> providing marine seismic data obtained by a seismic streamer comprising a plurality of detectors, the marine seismic data having a total acoustic wavefield that includes an upgoing acoustic wavefield and a downgoing acoustic wavefield;
>
> obtaining wave-height measurements at detector locations;
>
> performing, using a processor, a deghosting operation to determine a part of the total acoustic wavefield corresponding to one of the up going acoustic wavefield and the downgoing acoustic wavefield, wherein performing the deghosting operation comprises accounting for a varying vertical distance between a detector of the seismic streamer and a sea surface represented by the wave-height measurements, wherein the varying vertical distance is time variant, spatially variant, or both;
>
> identifying, using the processor, one of the up going and downgoing acoustic wavefields in the total acoustic wavefield based on a result of the deghosting operation;
>
> removing, using the processor, the downgoing acoustic wavefield from the total acoustic wavefield; and
>
> showing a wavefield comprising the upgoing acoustic wavefield.

## REJECTIONS

Claims 1, 2, 5–17, and 19 are rejected as being directed to patent-ineligible subject matter under 35 U.S.C. § 101.

Claims 1, 2, 5, 6, 8–14, 16, 17, and 19 are rejected under 35 U.S.C. § 103(a) as unpatentable over Ali Ozbek, *Crossline wavefield reconstruction from multicomponent streamer data*: *Part 1— Multichannel interpolation by matching pursuit (MIMAP) using pressure and its crossline gradient* and *Part 2— Joint interpolation and 3D up/down separation by generalized*

*matching pursuit*, Geophysics, Vol. 75, No. 6, Nov.–Dec. 2010 and Ed Kragh, *Rough-sea deghosting using wave heights derived from low-frequency pressure recordings–A case study*, SEG Int'l Exposition and 74th Annual Meeting, Oct. 10–15, 2004.

Claim 7 is rejected under 35 U.S.C. § 103(a) as unpatentable over Ozbek, Kragh, and Johan O. A. Robertsson, *Rough-sea deghosting using a single streamer and a pressure gradient approximation*, Geophysics, Vol. 67, No. 6, Nov.–Dec. 2002, p. 2005).

Claim 15 is rejected under 35 U.S.C. § 103(a) as unpatentable over Ozbek, Kragh, Robertsson, and Moldoveanu, *Broadband Seismic Methods for Towed-streamer Acquisition*, 74th EAGE Conference incorporating SPE EUROPEC 2012, Copenhagen, Denmark, June 4–7, 2012.

## ANALYSIS

### *Claims 1, 2, 5–17, and 19 As Directed To Patent-Ineligible Subject Matter*

Appellants argue claims 1, 2, 5–17, and 19 as a group. *See* Br. 10–15. We select claim 1 as representative, with claims 2, 5–17, and 19 standing or falling with claim 1. 37 C.F.R. § 41.37(c)(1)(iv). The Examiner finds that claim 1 is directed to an abstract idea of obtaining marine seismic data, and processing that data by (1) performing deghosting operations, (2) identifying upgoing and downgoing acoustic wavefields, and (3) removing downgoing acoustic wavefield data from the total acoustic wavefield using an algorithm. Final Act. 2–3; Ans. 3. The Examiner finds that claim 1 does not recite any improvement in computer technology but merely uses computers to perform known signal/image processing. Final Act. 3–4, 10. The Examiner also finds that the claimed method does not improve seismic imaging. Ans. 3.

Appellants argue that the claims are directed to an improved seismic survey technology that "expressly results in an improved seismic *image* (the wavefield) being shown." Appeal Br. 11. In particular, Appellants argue that prior art techniques assume the sea is flat, but the claims are directed to a specific technique that improves seismic survey technology for deghosting marine seismic data in the presence of rough seas by measuring wave height and therefore "the claims represent a software improvement, *i.e.*, a specific solution to a software problem." *Id.* at 12, 14. In this regard, Appellants argue that the "specification provides clear evidence that the described and claimed invention is superior to the prior art and addresses an identified problem." *Id.* at 13.

We analyze patent-eligibility of claim 1, as did the Examiner, under the two-step framework of *Alice Corp. Pty. Ltd. v. CLS Bank Int'l*, 134 S. Ct. 2347, 2355 (2014) and *Mayo Collaborative Services v. Prometheus Labs., Inc.,* 132 S. Ct. 1289 (2012). First, we consider whether claim 1 is directed to a patent-ineligible concept such as a law of nature, natural phenomena, or an abstract idea. *Alice*, 134 S. Ct. at 2355. If claim 1 is directed to a patent-ineligible concept, then we proceed in step two to consider the elements of claim 1 individually and as an ordered combination to determine whether any additional elements exist to transform the claim into a patent-eligible application. *Id.* This search for an "inventive concept" in the second step of the *Alice/Mayo* two-step analysis involves a search for an element or a combination of elements that is/are "sufficient to ensure that the patent in practice amounts to significantly more than a patent upon the [ineligible concept] itself." *Id.* (quoting *Mayo*, 132 S. Ct. at 1294).

*Alice* Step One

We agree with the Examiner that claim 1 is directed to an abstract idea of collecting information in the form of marine seismic data and wave height measurements at seismic streamer detector locations, analyzing the information by performing "deghosting operations" that account for varying vertical distances between a detector and a sea surface "represented by the wave-height measurement," to identify and remove "the downgoing acoustic wavefield from the total acoustic wavefield," and displaying certain results in the form of "a wavefield comprising the upgoing acoustic wavefield." Br. 21 (Claims App'x). Collecting information, even when it is limited to a particular content, is an abstract idea, as is analyzing such information by steps people go through in their minds as mental processes, and presenting the results of abstract processes of collecting and analyzing information is an abstract, ancillary part of the collection and analysis. *Elec. Power Grp., LLC v. Alstom S.A.*, 830 F.3d 1350, 1353–54 (Fed. Cir. 2016); *TDE Petroleum Data Solutions, Inc. v. AKM Enter., Inc.*, 657 F. App'x 991, 993 (Fed. Cir. 2016) (non-precedential), *cert. denied*, 137 S. Ct. 1230 (2017) (claim 1 is directed to an abstract idea as it recites operations performed by any general-purpose computer for the sort of data gathering and processing claim that is an abstract idea under step one of *Alice*, i.e., by storing well operation states and receiving mechanical and hydraulic data for a well operation to select an operation state); *Coffelt v. NVIDIA Corp.*, 680 F. App'x 1010, 1011 (Fed. Cir. 2017) (non-precedential), *cert. denied*, 137 S. Ct. 2143 (2017) (claims were directed to abstract idea of calculating and comparing steradian regions in space by analyzing information in steps people go through in their minds or by mathematical algorithms as mental processes).

Appellants disclose the use of acoustic wave propagation with marine seismic data studies to determine the total wave field and then the up-going pressure wave field is determined by partially or wholly removing the down-going wavefields that are reflected by the sea surface. Spec. ¶ 20. The ghost reflections result from up-going waves that are reflected downwardly at the sea surface and interfere with other up-going waves at a detector location to create gaps in the recorded signal, thereby reducing the useful bandwidth of the seismic data. *Id.* ¶ 2. Appellants deghost (i.e., remove) the down-going reflected waves using a generalized matching pursuit (GMP) approach that incorporates "a rough-sea ghost model" to account for the varying distance between detectors of a streamer and the sea surface. *Id.* ¶ 20. Appellants also disclose a variety of mathematical formulas that are used to perform the deghosting steps. *Id.* ¶¶ 26, 27, 29, 31, 33, 38, 39.

There is no disclosure that the GMP approach or the mathematical formulas are innovative or anything other than mathematical formulas that can be performed as mental processes. Even if any formulas represent an improvement in software, as Appellants allege, claim 1 does not recite any of their particulars. Instead, claim 1 recites "providing marine seismic data," "obtaining wave-height measurements," "performing, using a processor, a deghosting operation," and "removing a downgoing acoustic wavefield."

Unlike the claims in *Diamond v. Diehr*, in which Arrhenius' equation was used in an industrial process for curing rubber to change the state of the article and provide a more efficient solution, claim 1 recites general data gathering and analysis steps at a high level of generality to indicate claim 1 is directed to an abstract idea of data processing using unspecified math formulas. *See Diamond v. Diehr*, 450 U.S. 175, 188, 191–94 (1981).

Nor does *Enfish v. Microsoft Corp.*, 822 F.3d 1327 (Fed. Cir. 2016) support Appellants' argument that claim 1 in this case recites patent-eligible subject matter. *See* Br. 10–11. In *Enfish*, the claims were directed to, and also recited, elements of an improved self-referential or logical table for a computer database. *Enfish*, 822 F.3d at 1336–37. The claimed self-referential table functioned differently than conventional database structures and achieved benefits over conventional databases of increased flexibility, faster search times, and smaller memory requirements. *Id.* at 1337.

As the Examiner points out, Appellants do not describe any similar improvements in a database or other computer operation or process in the manner of *Enfish*. There is no indication that claim 1 recites a process that is more accurate, efficient, or faster than conventional deghosting operations. Final Act. 3; Ans. 3. Instead, as Appellants admit (*see* Br. 11–13), claim 1 collects additional information indicative of wave-heights and uses that data in a known deghosting calculation process. At best, claim 1 is directed to an abstract idea of deghosting data processing using wave height data. *See Synopsys, Inc. v. Mentor Graphics Corp.*, 839 F.3d 1138, 1151 (Fed. Cir. 2016) ("But a claim for a *new* abstract idea is still an abstract idea.").

Nor does *Research Corp. Techs. Inc. v. Microsoft Corp.*, 627 F.3d 859 (Fed. Cir. 2010) require a different result. There, the claims recited methods for halftoning gray scale images using a pixel-by-pixel comparison of the image against a blue noise mask to produce dot profiles thresholded at any level of gray scale images. *Research Corp.*, 627 F.3d at 865. The claims thus recited functional, palpable improvements in computer technology for halftoning. *Id.* at 868–69. Here, claim 1 recites "accounting for a varying vertical distance" rather than computer improvements for deghosting.

*Alice* Step Two

The abstract nature of the claimed method becomes more apparent under step two of *Alice* as we search for an inventive concept or element to elevate the abstract idea into a patent-eligible application beyond merely reciting the abstract idea in a particular environment with generic computers that perform well-known data-manipulation functions of such computers.

Appellants argue that the claims recite more than an abstract idea and are analogous to the digital image processing claims that were held patent-eligible in *Research Corporation* because "the mathematical operation, part of the deghosting operation, is linked to the processor's ability to process electronic signals" [and] adds substantially more than simply performing the deghosting operation, because the ghost signals are received as part of the acquired signal, identified, and then removed, as recited in the claim." Br. 14. Appellants also argue that the claims "recite concrete process steps to process real-world data with a physical goal in mind" versus a mere concept of calculating data on a computer. *Id.* at 15.

The claims in *Research Corp.* recited a physical array "thresholded at a number of levels produces a number of dot profiles" and "substantially all of said number of dot profiles have a power spectrum characteristic of a blue noise power spectrum for the level at which the dot profile is produced" and a "halftoning mask is designed to produce substantially all visually pleasing dot profiles when thresholded at a number of levels." *Research Corp.*, 627 F.3d at 871. Here, claim 1 recites a processor as a mere tool that implements an abstract idea. *See Alice*, 134 S. Ct. at 2358 (reciting the use of a generic computer in a particular environment cannot make an abstract idea patent-eligible); *Elec. Power Grp.*, 830 F.3d at 1354–55 (same).

Thus, Appellants implement their process on computing system 100A (Fig. 7) such as individual computer system 101A or a distributed system. Spec. ¶ 43. Computer system 101A has one or more analysis modules 102 configured to perform tasks on one or more processors 104 connected to storage media 106A. *Id.* The processor may include a microprocessor, microcontroller, processor module or subsystem, or a programmable integrated circuit, programmable gate array or other control or computing device. *Id.* ¶ 44. Storage media 106A can be a computer or a machine-readable storage media. *Id.* ¶ 44. Appellants do not disclose or claim any innovative computer architecture or functions for the deghosting process to elevate claim 1 above an abstract idea. If innovation exists in this process, it is not claimed. Instead, claim 1 accounts for varying vertical distances of a detector relative to a sea surface during deghosting with no apparent change in the images produced.[2] *See* Br. 15; Final Act. 10; Spec. Figs. 2, 3.

Thus, we sustain the rejection of claims 1, 2, 5–17, and 19.

*Claims 1, 2, 5, 6, 8–14, 16, 17, and 19*
*Rejected Over Ozbek and Kragh*

Regarding claim 1, which we select as representative based on Appellants' argument of the claims as a group (Br. 15–18), the Examiner relies on Ozbek to teach all of the claimed steps to include a deghosting operation, except for the use of wave height measurements at the detector locations. Final Act. 4–6. The Examiner relies on Kragh to teach this step and determines it would have been obvious to include this step on Ozbek to compensate for rough seas, as Kragh teaches. *Id.* at 6, 10–11.

[2] As discussed in the prior art rejections in the next section, the abstract idea of using a rough sea model of different wave heights was known in the prior art and was implemented using streamer detectors as Appellants disclose.

Appellants argue first that Ozbek considers only flat sea conditions and does not account for varying vertical distance between a detector of a streamer and a sea surface as claimed. Br. 15–17. This argument is not persuasive because the Examiner relies on Kragh, not Ozbek, to teach this feature as discussed above.

Appellants argue second that Kragh *estimates* wave heights rather than *measure* wave heights as claimed. *Id.* at 18. This argument is not persuasive because, as the Examiner correctly finds, Kragh determines wave height for rough sea conditions in the exact manner as Appellants disclose. Final Act. 10–11; Ans. 4–5. Kragh calculates wave heights for deghosting a single towed streamer to compensate for rough sea responses by using the seismic streamer detectors to record very low frequencies of pressure below 0.5 Hz. Kragh, p. 1. Appellants "measure" wave height in the very same way by acquiring ultra-low frequency pressure data at each detector location "from which the [wave] heights may be *derived*." Spec. ¶ 23 (emphasis added). Thus, Appellants do not disclose measuring wave height directly. Rather, like Kragh, they measure very low frequencies of pressure at streamer detectors and use that data to "derive" wave heights.

Thus, we sustain the rejection of claims 1, 2, 5–17, and 19.

*Claim 7*
*Rejected Over Ozbek, Kragh, and Robertsson*

Appellants argue that claim 7 is allowable because it depends from claim 6, which is allowable for the reasons presented above for the previous rejection. Br. 18. Because we sustain the rejection of claim 6, this argument is not persuasive, and we also sustain the rejection of claim 7.

*Claim 15*
*Rejected Over Ozbek, Kragh, Robertsson, and Moldoveanu*

Appellants argue that claim 15 is allowable because it depends from claim 1, which is allowable for the reasons presented above. *See* Br. 18. Because we sustain the rejection of claim 1, this argument is not persuasive and we also sustain the rejection of claim 15.

## DECISION

We affirm the rejection of claims 1, 2, 5–17, and 19 under 35 U.S.C. § 101 as being directed to patent-ineligible subject matter.

We affirm the prior art rejections of claims 1, 2, 5–17, and 19 under 35 U.S.C. § 103(a).

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