Citation: Landmark Graphics Corporation (Re), 2023 CACP 25

Commissioner's Decision #1658

Décision du commissaire nº 1658

Date: 2023-10-27

TOPIC:	J00	Meaning of Art
	J10	Computer Programs
	B00	Ambiguity or Indefiniteness

SUJET:	J00	Signification de la technique
	J10	Programme d'ordinateur
	B00	Caractère ambigu ou indéfini

Application No. 2,939,218

Demande nº 2 939 218

IN THE CANADIAN PATENT OFFICE

DECISION OF THE COMMISSIONER OF PATENTS

Patent application number 2,939,218, having been rejected under subsection 30(3) of the *Patent Rules* (SOR/96–423) as they read immediately before October 30, 2019, has consequently been reviewed in accordance with paragraph 199(3)(c) of the *Patent Rules* (SOR/2019–251). The recommendation of the Patent Appeal Board and the decision of the Commissioner are to refuse the application unless necessary amendments are made.

Agent for the Applicant:

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INTRODUCTION

[1] This recommendation concerns the review of rejected Canadian patent application number 2,939,218 which is entitled “MODELING GEOLOGIC SURFACES USING UNILATERAL NON-NODE CONSTRAINTS FROM NEIGHBORING SURFACES IN THE STRATIGRAPHIC SEQUENCE” and is owned by Landmark Graphics Corporation (the Applicant).

[2] A review of the rejected application has been conducted by the Patent Appeal Board (the Board) pursuant to paragraph 199(3)(c) of the *Patent Rules* (SOR/2019-251) (*Patent Rules*). As explained in more detail below, my recommendation to the Commissioner of Patents is to refuse the application unless necessary amendments are made.

BACKGROUND

The application

[3] The application was filed under the *Patent Cooperation Treaty* and has an effective filing date of March 10, 2014, in Canada. It was laid open to public inspection on September 17, 2015.

[4] The application relates generally to a method and system for modeling three-dimensional geologic surfaces representing a constraining surface and a constrained surface, wherein these surfaces are in a stratigraphic conforming relationship and do not intersect or overlap. Based on the three-dimensional geologic model, an oil field is prospected, drilled or developed.

[5] The application has 20 claims on file (claims on file), which were received at the Patent Office on September 11, 2018.

Prosecution history

[6] On October 2, 2019, a Final Action was issued pursuant to subsection 30(4) of the *Patent Rules* (SOR/96–423) as they read immediately before October 30, 2019. The Final Action identified the following defect in the application:

- Claims 1-20 on file are directed to subject-matter that lies outside the definition of "invention" and do not comply with section 2 of the *Patent Act*.

[7] In a response to the Final Action dated January 14, 2020, the Applicant submitted arguments in favour of patentability of the claims on file under section 2 of the *Patent Act*.

[8] As the Examiner considered the application not to comply with section 2 of the *Patent Act*, pursuant to paragraph 199(3)(c) of the *Patent Rules*, the application was forwarded to the Board for review on April 7, 2020, along with an explanation outlined in a Summary of Reasons.

[9] In a letter dated April 24, 2020, the Board forwarded to the Applicant a copy of the Summary of Reasons along with a letter acknowledging the rejection and requested an indication of the Applicant's continued interest in having the application reviewed.

[10] In a response dated May 20, 2020, the Applicant indicated their continued interest in having the application reviewed.

[11] The undersigned was assigned to review the instant application under paragraph 199(3)(c) of the *Patent Rules*.

[12] In a preliminary review letter (PR letter) dated April 1, 2022, I presented my preliminary analysis with respect to the claims on file. I was of the preliminary view that:

- Claims 1-9 on file are directed to patentable subject matter and comply with section 2 and subsection 27(8) of the *Patent Act*,

- Claims 10-20 on file are directed to non-patentable subject matter and do not comply with section 2 and subsection 27(8) of the *Patent Act*, and

- Claims 1, 10 and 19 on file are indefinite and do not comply with subsection 27(4) of the *Patent Act*.

[13] The PR letter also offered the Applicant the opportunities to make written submissions and to attend an oral hearing. The Applicant indicated in an email dated April 11, 2022, that an oral hearing was not required.

[14] In a response to the PR letter (RPR) dated April 25, 2022, the Applicant submitted a set of proposed claims 1-9 (proposed claim set 1) and provided arguments in favour of their patentability.

[15] Due to an indefiniteness defect in the proposed claim set-1, the Applicant submitted a second set of proposed claims 1-9 (proposed claim set-2) on June 15, 2022.

Issues

[16] This review will address the following issues:

- whether claims 1-20 on file are directed to patentable subject-matter and comply with section 2 and subsection 27(8) of the *Patent Act*, and
- whether claims 1, 10 and 19 on file are indefinite and non-compliant with subsection 27(4) of the *Patent Act*.

[17] In this review, I first consider the issues that pertain to the claims on file. I then consider whether the latest proposed amendments constitute amendments necessary for compliance with the *Patent Act* and *Patent Rules* under subsection 86(11) of the *Patent Rules*.

LEGAL PRINCIPLES AND OFFICE PRACTICE

Purposive construction

[18] In accordance with *Free World Trust v Électro Santé Inc*, 2000 SCC 66, and *Whirlpool Corp v Camco Inc*, 2000 SCC 67, purposive construction is performed from the point of view of the person skilled in the art in light of the relevant common general knowledge (CGK), considering the whole of the disclosure including the specification and drawings. In addition to interpreting the meaning of the terms of a claim, purposive construction distinguishes the

essential elements of the claim from the non-essential elements. Whether or not an element is essential depends on the intent expressed in or inferred from the claim, and on whether it would have been obvious to the skilled person that a variant has a material effect upon the way the invention works.

[19] "Patentable Subject-Matter under the *Patent Act*" (CIPO, November 2020) [*PN2020–04*] notes that all elements set out in a claim are presumed essential unless it is established otherwise, or such presumption is contrary to the claim language.

Patentable subject matter

[20] The definition of invention is set out in section 2 of the *Patent Act*:

> ***invention*** means any new and useful art, process, machine, manufacture or composition of matter, or any new and useful improvement in any art, process, machine, manufacture or composition of matter.

[21] Subsection 27(8) of the *Patent Act* also prescribes that:

> No patent shall be granted for any mere scientific principle or abstract theorem.

[22] *PN2020–04* describes the Patent Office's approach to determining if a claim is patentable subject matter:

> To be both patentable subject-matter and not be prohibited under subsection 27(8) of the *Patent Act*, the subject-matter defined by a claim must be limited to or narrower than an actual invention that either has physical existence or manifests a discernible physical effect or change and that relates to the manual or productive arts, meaning those arts involving or concerned with applied and industrial sciences as distinguished in particular from the fine arts or works of art that are inventive only in an artistic or aesthetic sense.

[23] *PN2020–04* further describes the Patent Office's approach to determining if a computer-related invention is patentable subject matter. For example, the mere fact that a computer is among the essential elements of the claimed invention does not necessarily mean that the claimed invention is patentable subject matter. An algorithm itself is abstract and non-patentable subject

matter. A computer programmed to merely process the algorithm in a well-known manner without solving any problem in the functioning of the computer will not make it patentable subject matter because the computer and the algorithm do not form part of a single actual invention that solves a problem related to the manual or productive arts. On the other hand, if processing the algorithm improves the functioning of the computer, then the computer and the algorithm would together form a single actual invention that solves a problem related to the manual or productive arts and the subject matter defined by the claim would be patentable.

[24] In *Schlumberger Canada Ltd v Commissioner of Patents*, [1982] 1 FC 845 (CA) [*Schlumberger*], the Court concluded that, although computers were necessary for the invention to be put into practice, the computer did not form part of "what has been discovered" and thus was not relevant in determining whether the claimed invention was patentable subject-matter; the computer was merely being used to make the kind of calculations it was invented to make.

[25] Furthermore, in *Canada (Attorney General) v Amazon.com Inc*, 2011 FCA 328 [*Amazon*], at paragraph 66, the Court indicated that "because a patent cannot be granted for an abstract idea, it is implicit in the definition of "invention" that patentable subject matter must be something with physical existence, or something that manifests a discernible effect or change." The court further noted at paragraph 69 that the "physicality requirement" cannot be met merely by the fact that the claimed invention has a practical application.

[26] In *Canada (Attorney General) v. Benjamin Moore & Co.*, 2023 FCA 168, at paragraphs 89 and 94, the Court confirmed that the requirement set out in paragraph 66 of *Amazon* is still valid.

Indefiniteness

[27] Subsection 27(4) of the *Patent Act* requires that a claim distinctly and explicitly define subject matter:

> The specification must end with a claim or claims defining distinctly and in explicit terms the subject-matter of the invention for which an exclusive privilege or property is claimed.

[28] In *Minerals Separation North American Corp v Noranda Mines Ltd*, [1947] Ex CR 306 [*Minerals Separation*], at 352, the Court emphasized both the obligation of an applicant to make clear in the claims the ambit of the monopoly sought and the requirement that the terms used in the claims be clear and precise:

> By his claims the inventor puts fences around the fields of his monopoly and warns the public against trespassing on his property. His fences must be clearly placed in order to give the necessary warning and he must not fence in any property that is not his own. The terms of a claim must be free from avoidable ambiguity or obscurity and must not be flexible; they must be clear and precise so that the public will be able to know not only where it must not trespass but also where it may safely go.

ANALYSIS

Purposive construction

The person skilled in the art and their common general knowledge

[29] The PR letter set out my preliminary characterization of the skilled person and their relevant CGK.

[30] As set out in the PR letter and taken from the Final Action, the person skilled in the art was characterized as:

> a person or a team of people skilled in modelling underground formations including three-dimensional (3D) geologic models of subsurface stratigraphy (see instant description, paragraphs [0004]-[0006]), and also possessing knowledge of computer programming and utilizing commonly used computerized features and communication and data storage and processing means (description, paragraphs [0033]-[0041]).

[31] The Applicant did not dispute the above characterization in their response to PR letter. Therefore, I adopt the same characterization in the analysis below.

[32] As set out in the PR letter and taken from the Final Action, the relevant CGK was characterized as the following:

- obtaining data points from data collected during the drilling of wells in the region, or from other scientific evidence of the existence of surfaces below the ground.

- construction of 3D geologic models of the subsurface stratigraphy (3D surface models) used for prospecting, drilling and developing oil fields, the 3D surface models being constructed based on 3D data points that represent points on stratigraphic surfaces below the ground, wherein the 3D data points may come from data collected during the drilling of wells in the region, or from other scientific evidence of the existence of surfaces below the ground.

- known algorithms, and constraints that can be placed on the algorithms, used to interpolate and extrapolate the 3D data points into the surfaces; and

- modelling geologic surfaces based on building first one of the surfaces (the constraining surface) using only the 3D data points that are thought to intersect that surface, followed by transforming the 3D data points of the second surface (the constrained surface) to build a thickness map representing the thickness between the two surfaces, and building the constrained surface by adding the values for the nodes on a solution grid representing the 3D surface model to the z values for the constraining surface that will yield a 3D surface model of the constrained surface in the z domain.

[33] The Applicant did not dispute the above characterization in their response to the PR letter. Therefore, I adopt the same characterization in the analysis below.

The essential elements

[34] The instant application contains 20 claims on file, including independent claims 1, 10 and 19. As indicated in the PR letter, due to the variations in the independent claims, I take claim 1 as representative of claims 1-9, and claim 10 as representative of claims 10-20.

[35] Claim 1 on file reads:

> 1. A method for prospecting, drilling, or developing an oil field comprising:
>
> a) performing drilling in a region and collecting data during the drilling, the data representing points on stratigraphic surfaces below ground.
>
> b) inputting the data into a computer comprising a processor.

c) approximating from the data, one of the constraining surfaces and the constraining surface and the constrained surface using the processor, each approximated surface representing a respective solution grid with at least four nodes, each node having an initialized value.

d) determining, using the processor, simultaneous linear equations for solving the initialized values for the nodes on each respective solution grid using only three- dimensional data points for the respective one of the constraining surfaces and the constraining surface and the constrained surface.

e) performing, using the processor, one of:

interpolating values for the constrained surface at x/y locations on the constrained surface corresponding to x/y locations of the nodes on the solution grid for the constraining surface using the three-dimensional data points for the constrained surface only at x/y locations that are closest to the x/y locations of the nodes on the solution grid for the constraining surface, the interpolated values representing interpolated values for nodes on the constrained surface; and

approximating one of new values for the nodes on the solution grid for the constraining surface and new values for the nodes on the solution grids for the constraining surface and the constrained surface using the simultaneous linear equations and one of the initialized value for each node, new values for each respective node and adjusted values for each respective node; and

f) performing, using the processor, one of:

adjusting the new values for the nodes on the solution grid for the constraining surface that overlap the interpolated values for the nodes on the constrained surface; and

adjusting i) the new values for the nodes on the solution grid for the constraining surface that overlap the new values for the nodes on the solution grid for the constrained surface, and ii) the new values for the nodes on the solution grid for the constrained surface that overlap the new values for the nodes on the solution grid for the constraining surface.

wherein the oil field is prospected, drilled, or developed based on construction of a three-dimensional geologic model of the stratigraphic surfaces below ground as performed in steps (a)-(f).

[36] Claim 10 on file reads:

10. A non-transitory program carrier device tangibly carrying computer-executable instructions for modeling geologic surfaces using a constraining surface and a constrained surface, the instructions being executable by a computer processor to implement:

a) approximating, from data collected during drilling in a region and representing points on stratigraphic surfaces below ground, one of the constraining surface and the constraining surface and the constrained surface, each approximated surface representing a respective solution grid with at least four nodes, each node having an initialized value.

b) determining simultaneous linear equations for solving the initialized values for the nodes on each respective solution grid using only three-dimensional data points for the respective one of the constraining surface and the constraining surface and the constrained surface;

c) performing one of:

interpolating values for the constrained surface at x/y locations on the constrained surface corresponding to x/y locations of the nodes on the solution grid for the constraining surface using the three-dimensional data points for the constrained surface only at x/y locations that are closest to the x/y locations of the nodes on the solution grid for the constraining surface, the interpolated values representing interpolated values for nodes on the constrained surface; and

approximating one of new values for the nodes on the solution grid for the constraining surface and new values for the nodes on the solution grids for the constraining surface and the constrained surface using the simultaneous linear equations and one of the initialized value for each node, new values for each respective node and adjusted values for each respective node; and

d) performing one of:

adjusting the new values for the nodes on the solution grid for the constraining surface that overlap the interpolated values for the nodes on the constrained surface; and

adjusting i) the new values for the nodes on the solution grid for the constraining surface that overlap the new values for the nodes on the solution grid for the constrained surface, and ii) the new values for the nodes on the solution grid for the constrained surface that overlap the new values for the nodes on the solution grid for the constraining surface; and

> wherein an oil field is prospected, drilled, or developed following construction of a three-dimensional geologic model of the stratigraphic surfaces below ground based on steps (a)-(d).

[37] Independent claim 19 is directed a system and, in addition to the features in claim 10, recites an iterative process for approximating the new and adjusted values. Dependent claims 2-9, 11-18 and 20 recite further details regarding the claimed algorithm for modeling geologic surfaces.

[38] The PR letter, at page 9, set out my preliminary view of the essential elements of the claims on file:

> With respect to the claims on file, the person skilled in the art would understand that there is no use of language in any of the claims indicating that the elements in each claim are optional, a preferred embodiment or non-essential. Although independent claims 1, 10 and 19 recite a list of alternatives, such as "the oil field is prospected, drilled, or developed", each alternative is an independent embodiment of the claim, wherein only the selected alternative is essential.
>
> Therefore, in my preliminary view, all the elements of the claims on file are presumed to be essential.

[39] As the Applicant did not dispute the above preliminary view in their response to PR letter, I adopt the above position in this review.

Meaning of terms

[40] Purposive construction is also used to construe the meaning of claim terms as understood by the person skilled in the art.

[41] The PR letter set out my preliminary view of the meaning of certain terms in the claims on file.

[42] The PR letter, at pages 9-10, stated:

> Independent claims 1, 10 and 19 on file recite "wherein an oil field is prospected, drilled, or developed." In my preliminary view, the patentable subject matter analysis requires the meaning of "prospecting" and "developing" to be construed. The independent claims recite that these steps are based on, or follow, the construction of the three-dimensional geologic model. The description (paragraph [004]) does not define the terms "prospecting" and "developing," or suggest how the geologic

> model is used for these activities. Since the model can only be constructed after data has been physically gathered from the region, the claimed "prospecting" or "developing" do not include this physical data collection. Given this fact, and the lack of detail in the specification, my preliminary view is that the skilled person would construe "prospecting an oil field" as encompassing performing studies to evaluate an oil field and determine potential prospects containing oil reserves. The activity would not necessarily include any physical steps like exploratory drilling or sampling wells.
>
> Similarly, the skilled person would construe "developing an oil field" as encompassing performing studies, creating designs and plans to prepare for field production. The activity would not necessarily involve any physical steps like using machinery or drilling production wells.

[43] As the Applicant did not dispute the above preliminary view in their response to the PR letter, I adopt the above position in this review.

Patentable subject matter

[44] In the PR letter, I set out my preliminary view on whether the claims on file are directed to the patentable subject matter.

[45] As stated in the PR letter at pages 10-13:

> The [Final Action] on pages 2-4 presented a purposive construction of the claims on file in accordance with the previous Patent Office practice, now superseded by *PN2020–04*. It identified the essential elements of the claims on file as comprising a plan, scheme or algorithm for performing mathematical operations in order to transform available information into a new and organized collection of useful information. The [Final Action] consequently concluded that the claims are directed to subject-matter that lies outside the definition of "invention" and do not comply with section 2 of the *Patent Act*.
>
> In light of the guidance on assessment of patentable subject matter in *PN2020–04* and the essential elements identified above, I undertake anew the assessment of patentable subject-matter of the claims on file.
>
> As stated in *PN2020–04*, "[t]o be both patentable subject-matter and not be prohibited under subsection 27(8) of the *Patent Act*, the subject-matter defined by a claim must be limited to or narrower than an actual invention that either has physical existence or manifests a discernible physical effect or change and that relates to the manual or productive arts", referencing, in part, *[Amazon]* paras 42, 58 and 66 to 69.

Having considered that all the claimed elements are essential, it is necessary to determine whether these elements form a single actual invention that either has physical existence or manifests a discernible physical effect or change.

Claims 1-9

Independent claim 1 on file sets out a method comprising performing drilling in a region and collecting data during the drilling, wherein the data is entered into a computer in order to construct a three-dimensional model of the stratigraphic surfaces below ground.

In my preliminary view, it is evident from the claim language and the rest of the specification that step (a) of performing drilling and collecting data during the drilling cooperates with the computer processing steps (b-f) to produce better results by using the claimed modeling algorithm. In my preliminary view, the actual invention of claims 1-9 on file includes the step of drilling and collecting data during the drilling, and therefore satisfies the physicality requirement as set out in *PN2020–04*.

It is my preliminary view that the essential elements of claims 1-9 on file form a single actual invention that has physical existence or manifests a discernible physical effect or change, and that relates to the manual or productive arts.

In light of the above, it is my preliminary view that claims 1-9 on file are directed to patentable subject matter and comply with section 2 and subsection 27(8) of the *Patent Act*.

Claims 10-20

Independent claim 10 on file sets out a non-transitory program carrier device tangibly carrying computer-executable instructions for modeling geologic surfaces, the instructions being executable by a computer processor to implement method steps (a-d) wherein an oil field is prospected, drilled, or developed following construction of the geologic model based on steps (a-d).

Contrary to claim 1 which recites “performing drilling [portion of original text omitted] and collecting data during the drilling”, claim 10 only includes the step of “approximating, from data collected during drilling in a region and representing points on stratigraphic surfaces below ground”. In my preliminary view, it is evident from the claim language and the rest of the specification that the data representing points on stratigraphic surfaces is merely made available to the computer processor in claim 10. However, the claim language does not include the step of performing drilling and collecting data during the drilling. Additionally, claim 10 recites “wherein an oil field is prospected, drilled, or developed”. As discussed in the Meaning of terms section above, it is my preliminary view that the skilled person would reasonably construe

prospecting or developing an oil field as encompassing performing studies and planning without necessarily including any physical steps such as drilling wells. Therefore, in my preliminary view, the above features do not impart physicality to the subject-matter of claim 10 on file.

Furthermore, claim 10 recites computer-related elements and steps. In the [response to the Final Action] on page 13, the Applicant argued that:

> the computer and processor cannot be dismissed as non-essential since the invention as a whole and as claimed cannot be carried out otherwise. Applicant submits that to conclude the computer and processor merely provide context to the solution is erroneous. The intent of the inventors is obvious, namely that elements of computers are indeed essential. The claimed subject matter involves complex operations which would be difficult, time-consuming, and improbable without computer implementation. One skilled in the art would appreciate that the omission of at least the computer processor that performs recited steps (d)-(f) would affect at least one function, way, or result. Substituting a different method and computer program product implementation element would have an effect on the working of the invention. The substitution, for example of a human mind rather than a computer, would materially affect the claimed invention in terms of efficacy, timeliness, and accuracy. The computer and processor are thus required and are recited in the claim language.

As explained in *Amazon* (paras 61-63, 66, 69), a computer cannot be used to give an abstract idea a practical application satisfying the physicality requirement implicit in the definition of invention in section 2 of the *Patent Act* simply by programming the idea into the computer by means of an algorithm. This is the situation in *Schlumberger* where the computer was merely being used to make the kind of calculations it was invented to make.

According to *PN2020–04*, “[i]f a computer is merely used in a well-known manner, the use of the computer will not be sufficient to render the disembodied idea, scientific principle or abstract theorem patentable subject-matter and outside the prohibition under subsection 27(8) of the *Patent Act*”.

In my preliminary view, there is no suggestion in the specification that the claimed computer-related elements such as the non-transitory program carrier device or the computer processor represent anything other than generic computer components, or that the functioning of the computer is improved by the claimed steps. In my preliminary view, the computer is merely used in a well-known manner and is therefore not part of the single actual invention of claim 10 on file. Rather, the actual invention is the algorithm for creating a geological model, which is a set of abstract data manipulations and calculation and does not satisfy the physicality requirement as set out in *PN2020–04*.

> Independent claim 19 on file is directed to a system comprising a processing device and a non-transitory program carrier performing method steps equivalent to those in claim 10 on file with the addition of an iterative process to approximate new and adjusted values. Dependent claims 11-18 and 20 specify further details of the algorithm to create a geological model. In my preliminary view, the actual inventions of these claims are directed to a set of abstract data manipulations and calculations, which do not satisfy the physicality requirement for the same reasons outlined above.
>
> In light of the above, it is my preliminary view that claims 10-20 on file are directed to non-patentable subject matter, falling outside the definition of invention in section 2 of the *Patent Act* and prohibited by subsection 27(8) of the *Patent Act*.

[46] The Applicant did not dispute the above preliminary view in their response to the PR letter. I therefore conclude that:

- claims 1-9 on file are directed to patentable subject matter and comply with section 2 and subsection 27(8) of the *Patent Act*, and
- claims 10-20 on file are directed to non-patentable subject matter and do not comply with section 2 and subsection 27(8) of the *Patent Act*.

Indefiniteness

[47] In the PR letter, I set out my preliminary view that claims 1, 10 and 19 on file are indefinite and do not comply with subsection 27(4) of the *Patent Act*.

[48] As stated in the PR letter at pages 13-14:

> Claim 1 on file recites step (e) which includes “performing [portion of original text omitted] one of: interpolating values for the constrained surface [portion of original text omitted]; and approximating one of new values for the nodes on the solution grid for the constraining surface and new values for the nodes on the solution grids for the constraining surface and the constrained surface”. However, step (f) recites:
>
> f) performing, using the processor, one of:
>
> adjusting the new values for the nodes on the solution grid for the constraining surface that overlap the interpolated values for the nodes on the constrained surface; and

adjusting i) the new values for the nodes on the solution grid for the constraining surface that overlap the new values for the nodes on the solution grid for the constrained surface, and ii) the new values for the nodes on the solution grid for the constrained surface that overlap the new values for the nodes on the solution grid for the constraining surface.

In my preliminary view, it is not clear how the new values in step (f) could be obtained if, in step (e), only the first option of interpolating values is performed. It appears that the step of approximating new values in step (e) would always have to be performed. This is supported by the disclosure in the description and drawings. In particular, Figure 1A shows that conditional operator 135 only applies to the step of interpolating values (step 140), and that the step of approximating new values (step 150) is always performed.

Additionally, in my preliminary view, it is not clear how in step (f) the first option of adjusting the new values for the constraining surface that overlap interpolated values for the constrained surface could be performed, if the first option of interpolating in step (e) is not performed. It appears that the first option in step (f) is dependent on the result of the interpolating operation in step (e). This is also supported by the disclosure in the instant application. In particular, Figures 1A-1B show that conditional operator 155 that applies to the two options in step (f) (steps 160 and 165) is the same as conditional operator 135 which applies to the step of interpolating in step (e) (step 140).

Furthermore, claim 1 on file in step (e) recites:

> approximating one of new values for the nodes on the solution grid for the constraining surface and new values for the nodes on the solution grids for the constraining surface and the constrained surface using the simultaneous linear equations and one of the initialized value for each node, new values for each respective node and adjusted values for each respective node.

However, as mentioned above, step (f) recites adjusting the new values. In my preliminary view, approximating new values “using [portion of original text omitted] new values for each respective node and adjusted values for each respective node” causes ambiguity. It appears that the above expression in step (e) is directed to using new values to approximate the same new values. Additionally, step (e) uses adjusted values to approximate the new values. However, these adjusted values are in fact determined in the next step, namely step (f), using the same new values that are determined in step (e). According to paragraph [0024] of the description and step 150 in Figure 1A, the new values and adjusted values used to approximate the new values in step (e) are in fact from the previous iteration of the claimed method.

> It is therefore my preliminary view that the scope of claim 1 on file is not defined in a distinct and explicit manner, and that claim 1 on file is indefinite.
>
> Independent claims 10 and 19 on file recite similar features as those in claim 1. In my preliminary view, they are indefinite for the same reasons as outlined above.

[49] In their response to the PR letter, the Applicant did not dispute the above preliminary view and submitted proposed claims to remedy the above defects.

[50] The PR letter also stated the following at pages 14-15:

> Additionally, claim 1 on file recites that "the oil field is prospected, drilled, or developed based on construction of a three-dimensional geologic model of the stratigraphic surfaces below ground as performed in steps (a)-(f)". Claims 10 and 19 on file recite a similar expression with the exception of reciting that the oil field is prospected, drilled or developed "following construction" of the geologic model. As previously discussed, the description only mentions the terms prospecting, drilling and developing an oil field briefly in the background section in paragraph [0004] without disclosing what activities is encompassed in each of these claimed steps.
>
> Moreover, in my preliminary view, the instant specification does not disclose how the construction of the geologic model is connected with these claimed steps such that it would be clear to a skilled person how an oil field would be prospected, drilled or developed based on or following the construction of the claimed geologic model. Accordingly, in my preliminary view, the aforementioned feature does not define the scope of the independent claims on file in a clear, distinct and precise manner such that skilled persons will be able to determine whether or not what they propose to do will infringe the claims on file, consistent with *Minerals Separation*.
>
> In light of the above, it is my preliminary view that claims 1, 10 and 19 on file are indefinite and do not comply with subsection 27(4) of the *Patent Act*.

[51] In their response to the PR letter, the Applicant submitted arguments that "it would be clear to a skilled person how an oil field would be prospected, drilled or developed based on or following the construction of the claimed geologic model". The Applicant further submitted that "[t]he actual steps of prospecting, drilling, or developing an oil field are conventional and well known to those skilled in the art". I agree that the skilled person would be able to construe the terms prospecting, drilling and developing an oil field. However, as explained

in the PR letter, the claim language reciting prospecting, drilling or developing an oil field based on or following the construction of the geologic model does not define the connection between these steps and the construction of the model in a clear, distinct and precise manner such that the skilled persons would be able to determine whether or not what they proposed to do will infringe the claims on file.

[52] The Applicant submitted proposed claims to remedy the above defect.

[53] In light of the above, I conclude that claims 1, 10 and 19 on file are indefinite and do not comply with subsection 27(4) of the *Patent Act*.

Proposed Amendments

[54] In their response to the PR letter, the Applicant submitted proposed claim set-1 consisting of proposed claims 1-9. This included canceling claims 10-20 on file and amending claims 1 and 3 as follows:

- Step e) in claim 1 has been amended to include the phrases:

  "Determining, using the processor, if both the constraining surface and the constrained surface are being built, and if only the constraining surface is built, performing steps (i) and (ii) below; and if both the constraining surface and the constrained surface are being built, performing only step (ii) below:

  (i) interpolating values for the constrained surface at x/y locations on the constrained surface corresponding to x/y locations of the nodes on the solution grid for the constraining surface using the three-dimensional data points for the constrained surface only at x/y locations that are closest to the x/y locations of the nodes on the solution grid for the constraining surface, the interpolated values representing interpolated values for nodes on the constrained surface; and

  (ii) approximating one of new values for the nodes on the solution grid for the constraining surface and new values for the nodes on the solution grids for the constraining surf ace and the constrained surface using the simultaneous linear equations and one of the initialized value for each respective node and adjusted values for each respective node, the new values and the adjusted values were obtained from a previous iteration of the method."

- Step f) in claim 1 has been amended to include the phrases:

"Determining, using the processor, if both the constraining surface and the constrained surface are being built, and if only the constraining surface is built, performing steps (i) and (ii) below; and if both the constraining surface and the constrained surface are being built, performing only step (ii) below:

(i) adjusting the new values for the nodes on the solution grid for the constraining surf ace that overlap the interpolated values for the nodes on the constrained surface so that the constraining surface and the constrained surface are not overlapping or intersecting; and

(ii) adjusting i) the new values for the nodes on the solution grid for the constraining surface that overlap the new values for the nodes on the solution grid for the constrained surface, and ii) the new values for the nodes on the solution grid for the constrained surf ace that overlap the new values for the nodes on the solution grid for the constraining surface."

- The last phrases in claim 1 have been amended to recite:

  "Wherein performing steps (a)-(f) yields a three-dimensional geologic model of the stratigraphic surfaces below ground; and the oil field is prospected, drilled, or developed based on the three-dimensional geologic model."

- Claim 3 has been amended to include the phrase “adjusted value for the”.

[55] In my view, proposed claim set-1 overcomes the patentable subject matter defect and the indefiniteness defects identified in the PR letter. However, it introduces another indefiniteness defect. Proposed claim 1 in proposed claim set-1 recites in step e) part (ii) the following:

> approximating one of new values [portion of original text omitted] using the simultaneous linear equations and one of the initialized value for each respective node and adjusted values for each respective node, the new values and the adjusted values were obtained from a previous iteration of the method.

[56] Based on paragraph [0024] of the instant description and step 150 in Fig. 1A, the above approximating step uses the initialized value for each node from steps 120 or 190, the new values for each respective node from the last iteration of this step, or the adjusted value for each respective node from steps 160 or 165.

[57] However, proposed claim 1 in proposed claim set-1 recites that the approximating step uses one of the initialized value for each respective node and adjusted values for each respective node, without reciting new values from the previous iteration. Additionally, this omission causes ambiguity as it would not be clear what is meant by the term “new values” in the expression “the new values and the adjusted values were obtained from a previous iteration of the method”.

[58] In response to the identification of the above defect, the Applicant submitted a second proposed set of claims 1-9 (proposed claim set 2) on June 15, 2022. Claim 1 in proposed claim set-2 recites in step e) part (ii):

> approximating one of new values [portion of original text omitted] using the simultaneous linear equations and one of the initialized value for each respective node, new values for each respective node and adjusted values for each respective node, the new values and the adjusted values were obtained from a previous iteration of the method.

[59] In my view, proposed claim set-2 overcomes the indefiniteness defects identified above and complies with subsection 27(4) of the *Patent Act*.

[60] In light of the above, it is my view that the deletion of the claims on file and the insertion of proposed claim set-2 are considered necessary amendments for compliance with the *Patent Act* and *Patent Rules*, as required by subsection 86(11) of the *Patent Rules*.

CONCLUSIONS

[61] It is my view that:

- claims 1-9 on file are directed to patentable subject matter and comply with section 2 and subsection 27(8) of the *Patent Act*,
- claims 10-20 on file are directed to non-patentable subject matter and do not comply with section 2 and subsection 27(8) of the *Patent Act*,
- claims 1, 10 and 19 on file do not comply with subsection 27(4) of the *Patent Act*,

- proposed claim set-2 would comply with the *Patent Act* and *Patent Rules*, and is considered a necessary amendment under subsection 86(11) of the *Patent Rules*.

RECOMMENDATION OF THE BOARD

[63] In view of the above, I recommend that the Applicant be notified, in accordance with subsection 86(11) of the *Patent Rules*, that specific amendments are necessary for compliance with the *Patent Act* and *Patent Rules*, namely:

- the deletion of the claims on file, and
- the insertion of claims in proposed claim set-2 submitted by the Applicant on June 15, 2022.

Mehdi Ghayour

Member

DECISION OF THE COMMISSIONER

[64] I concur with the conclusions and recommendation of the Board. In accordance with subsection 86(11) of the *Patent Rules*, I hereby notify the Applicant that the following amendments, and only these amendments, must be made in accordance with paragraph 200(b) of the *Patent Rules* within three (3) months of the date of this decision, failing which I intend to refuse the application:

- the deletion of the claims on file, and
- the insertion of claims in proposed claim set-2 submitted by the Applicant on June 15, 2022.

Konstantinos Georgaras

Commissioner of Patents
Dated at Gatineau, Quebec
this 27th day of October, 2023