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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte VINCENT BERAUDIER and GEORGES-HENRI MOLL

Appeal 2015-000744
Application 13/243,928
Technology Center 2100

Before KALYAN K. DESHPANDE, DAVID M. KOHUT, and JUSTIN T. ARBES, *Administrative Patent Judges*.

DESHPANDE, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF CASE[1]

Appellants seek review under 35 U.S.C. § 134(a) of the Examiner's Final Rejection of claims 1–20. We have jurisdiction over the appeal pursuant to 35 U.S.C. § 6(b).

We AFFIRM.

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[1] Our Decision makes reference to Appellants' Reply Brief ("Reply Br.," filed October 6, 2014), and Appeal Brief ("App. Br.," filed July 22, 2014), and the Examiner's Answer ("Ans.," mailed August 26, 2014) and Final Office Action ("Final Act.," mailed March 12, 2014).

INVENTION

Appellants' invention is directed to computing systems that generate mixed integer linear programming matrices to optimize a data model. Spec. ¶ 1.

An understanding of the invention can be derived from a reading of exemplary claims 1 and 15, which are reproduced below.

> 1. A computer-implemented method of generating a mixed integer linear programming matrix for solving an optimization of a data model, comprising:
>
> programmatically generating an index definition to represent each primary key of each of a plurality of tables in an entity-relationship data model schema that represents the data model, and programmatically generating an index object to represent each value of each primary key;
>
> programmatically generating a constant definition to represent each input field of each of the tables, and programmatically generating a constant object to represent each value of each input field;
>
> programmatically generating a variable definition to represent each output field of each of the tables, and programmatically generating a variable object to represent each value of each output field;
>
> programmatically storing, in a symbolic matrix structure, at least one constraint on an optimization, each constraint reflecting at least one of the input fields, the constants, or the output fields;
>
> programmatically generating, from the symbolic matrix and the data model, a MIP matrix; and
>
> solving the MIP matrix with a MIP solver to yield the optimization.
>
> 15. A computer program product for generating a mixed integer linear programming matrix for solving an optimization of a data model, the computer program product comprising:

a computer readable storage medium having computer readable program code embodied therein, the computer readable program code configured for:

programmatically generating an index definition to represent each primary key of each of a plurality of tables in an entity-relationship data model schema that represents the data model, and programmatically generating an index object to represent each value of each primary key;

programmatically generating a constant definition to represent each input field of each of the tables, and programmatically generating a constant object to represent each value of each input field;

programmatically generating a variable definition to represent each output field of each of the tables, and programmatically generating a variable object to represent each value of each output field;

programmatically storing, in a symbolic matrix structure, at least one constraint on an optimization, each constraint reflecting at least one of the input fields, the constants, or the output fields;

programmatically generating, from the symbolic matrix and the data model, a MIP matrix; and

solving the MIP matrix with a MIP solver to yield the optimization.

REFERENCES

Moll	US 2009/0228309 A1	Sept. 10, 2009

Johannes Bisschop & Marcel Roelofs, ***AIMMS: The Language Reference,*** AIMMS 3.1 (2000). (“Bisschop”).

REJECTIONS

Claims 15–20 stand rejected under 35 U.S.C. § 101 as being directed to non-statutory subject matter. Final Act. 2–3.

Claims 1–5, 9–12, and 15–18 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Moll. Final Act. 3–16.

Claims 6–8, 13, 14, 19, and 20 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Moll and Bisschop. Final Act. 16–21.

ISSUES

The issue of whether the Examiner erred in rejecting claims 15–20 under 35 U.S.C. § 101 turns on whether claim 15 is directed to non-statutory subject matter.

The issue of whether the Examiner erred in rejecting claims 1–5, 9–12, and 15–18 under 35 U.S.C. § 102(b) as anticipated by Moll turns on whether Moll discloses generating a mixed integer program ("MIP") matrix from a symbolic matrix and a data model as recited by independent claims 1, 9, and 15.

The issue of whether the Examiner erred in rejecting claims 6–8, 13, 14, 19, and 20 under 35 U.S.C. § 103(a) as obvious over the combination of Moll and Bisschop turns on whether (a) the combination teaches a symbolic matrix comprising (i) a column for each of the variable definitions and (ii) a row containing an expression for each constraint, as recited by dependent claims 6, 13, and 19, and (b) the Examiner improperly combined Moll and Bisschop.

ANALYSIS

Claims 15–20 rejected under 35 U.S.C. § 101 as being directed to non-statutory subject matter

Claims 15–20 are directed to a "computer program product" comprising a "computer readable storage medium having computer readable program code embodied therein" configured to perform certain actions. The Examiner finds claims 15–20 are directed to non-statutory subject matter because the term "computer readable storage medium" encompasses non-statutory subject matter, such as a carrier wave.[2] Final Act. 2; Ans. 5. The Examiner finds "computer readable storage medium" includes non-statutory subject matter because the Specification does not preclude the term from including carrier waves. Final Act. 2 (citing Spec. ¶ 97). Appellants argue that the term "computer readable storage medium" is directed to only statutory subject matter based upon its description in the Specification, and its distinction from other types of media that include non-statutory subject matter. App. Br. 14–17 (citing Spec. ¶ 97); Reply Br. 2–3.

We disagree with Appellants. In the precedential case, *Ex parte Mewherter*, Appeal No. 2012-007692, 107 USPQ2d 1857, 1862, 2013 WL 4477509, *6–7 (PTAB May 8, 2013) (precedential), the Board concluded that unless the claim language, given its broadest reasonable interpretation in light of the specification, precludes non-statutory subject matter, a "storage medium" can potentially include non-statutory subject matter, such as signals *per se*, and thereby not satisfy § 101. *Ex parte Mewherter*, 107

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[2] The Examiner suggests modifying the claim language to include the adjective "non-transitory" for the recited "computer readable storage medium" to overcome the rejection. Final Act. 3 (emphasis in original). This suggestion is in accordance with guidance provided by the Office. *See* Subject Matter Eligibility of Computer Readable Media, 1351 Off. Gaz. Pat. Office 212 (Feb. 23, 2010) ("A claim drawn to such a computer readable medium that covers both transitory and non-transitory embodiments may be amended to narrow the claim to cover only statutory embodiments to avoid a rejection under 35 U.S.C. § 101 by adding the limitation 'non-transitory' to the claim.").

USPQ2d 1857, 1862 (PTAB 2013) (precedential).[3] The Specification here provides:

> The computer readable medium may be a computer readable signal medium or a computer readable storage medium. A computer readable storage medium may be, for *example*, but not limited to, an electronic, magnetic, optical, electromagnetic, infrared, or semiconductor system, apparatus, or device, or any suitable combination of the foregoing. More specific *examples (a non-exhaustive list)* of the computer readable storage medium would include the following: an electrical connection having one or more wires, a portable computer diskette, a hard disk, a random access memory ("RAM"), a read-only memory ("ROM"), an erasable programmable read-only memory ("EPROM" or flash memory), a portable compact disc read-only memory ("CD-ROM"), DVD, an optical storage device, a magnetic storage device, or any suitable combination of the foregoing. In the context of this document, *a computer readable storage medium may be any tangible medium that can contain or store a program for use by or in connection with an instruction execution system, apparatus, or device.*

Spec. ¶ 97 (emphasis added). The Specification, therefore, includes non-limiting examples constituting statutory subject matter, but does not expressly preclude the term "computer readable storage medium" from including non-statutory subject matter, such as signals *per se*. One of ordinary skill in the art would understand that the disputed term does not preclude non-statutory subject matter. *See id.* As the Examiner correctly

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[3] *See also* U.S. Patent & Trademark Office, *Subject Matter Eligibility of Computer-Readable Media*, 1351 Off. Gaz. Pat. Office 212 (Feb. 23, 2010) ("The broadest reasonable interpretation of a claim drawn to a computer readable medium (also called machine readable medium and other such variations) typically covers forms of non-transitory tangible media and transitory propagating signals *per se* in view of the ordinary and customary meaning of computer readable media, particularly when the specification is silent.").

found, the issue is not whether "computer readable storage medium" is distinct from "computer readable signal medium," but rather whether "computer readable storage medium," as recited in claim 15 and given its broadest reasonable interpretation in light of the Specification, encompasses non-statutory as well as statutory subject matter. *See* Ans. 5. We agree with the Examiner that it does.

Additionally, Appellants argue that in *Ex parte Bash*, Appeal No. 2009-007202, 2010 WL 5199590 (BPAI 2010) (non-precedential), the Board found the term "computer readable storage medium" to be statutory. App. Br. 16 (citing *Ex parte Bash*, Appeal No. 2009-007202, 2010 WL 5199590 (BPAI 2010) (non-precedential)). As a preliminary matter, *Ex parte Bash* has not been designated as precedential, and therefore, is not binding on this panel. Moreover, as the Board found in *Mewherter*, the specification at issue in *Bash* "contained express language that excluded transitory media from the definition of storage medium." 2013 WL 4477509, at *6. Thus, we are constrained by the decision in *Mewherter*, which held that "where . . . the broadest reasonable interpretations of all the claims each covers a signal *per se*, the claims must be rejected under 35 U.S.C. § 101 as covering non-statutory subject matter." *Id.* at *7.

Accordingly, we sustain the Examiner's rejection of claims 15–20 under 35 U.S.C. § 101 as being directed to non-statutory subject matter.

Claims 1–5, 9–12, and 15–18 rejected under 35 U.S.C. § 102(b) as anticipated by Moll

Independent claims 1, 9, and 15 recite "generating, from the symbolic matrix and the data model, a MIP matrix." Appellants argue that Moll fails to disclose generating a MIP matrix from a mathematical model because the mathematical model in Moll is not distinct from the MIP. App. Br. 18–20; Reply Br. 4. If the mathematical model is not distinct from the MIP, Appellants contend that the mathematical model cannot generate the MIP matrix because the model cannot generate itself. App. Br. 18–20; Reply Br. 4.

We do not find Appellants' argument persuasive. The Examiner finds that Moll discloses a mathematical model that defines relationships between entities within a MIP. Final Act. 4–5 (citing Moll ¶ 45); Ans. 8. The Examiner also finds that Moll discloses the use of data models to generate mathematical models. Ans. 9 (citing Moll ¶ 40). Additionally, the Examiner finds, and we agree, that even though the mathematical model of Moll is part of a MIP, one of ordinary skill in the art would reasonably understand that the model is a constituent part that serves as a distinct means to generate the MIP and its resulting matrix. Ans. 17–18. Thus, we are not persuaded by Appellants' argument that the mathematical model must be distinct from the MIP in order to generate the MIP matrix because Moll's model serves as a distinct means to generate the MIP matrix.

Claim 1 additionally recites "programmatically storing, in a symbolic matrix structure, at least one constraint." Appellants argue that the Examiner has misinterpreted Moll's disclosure of constraints in a MIP matrix to teach a symbolic matrix, because the mere inclusion of constraints within a matrix does not constitute a symbolic matrix. App. Br. 21–23; Reply Br. 5–7. Additionally, Appellants contend that because the constraints are not stored prior to generating the MIP matrix, the constraints cannot be used to generate the MIP matrix. App. Br. 21–23; Reply Br. 5–7.

We do not find Appellants' argument persuasive. The Examiner finds that the Specification describes a symbolic matrix as expressing constraints within a table or matrix. Ans. 11 (citing Spec. ¶ 53). The Examiner further finds Moll's constraint-containing tables disclose the claimed symbolic matrix because Moll's tables express constraints in a table, just as in the Specification. Final Act. 6–7 (citing Moll ¶ 81); Ans. 11 (citing Spec. ¶ 53). As discussed above, the Examiner finds, and we agree, that even though the constraint-containing table of Moll is part of a MIP, one of ordinary skill in the art would reasonably understand that the table is a constituent part that serves as distinct means to generate the MIP and its resulting matrix. Ans. 18. Thus, we do not find Appellants' arguments persuasive because they fail to explain sufficiently why a constraint-containing table that is used to generate the MIP matrix does not disclose the claimed symbolic matrix.

Accordingly, we sustain the Examiner's rejection of independent claims 1, 9, and 15. Appellants argue that dependent claims 2–5, 10–12, and 16–18 are patentable for the same reasons as their respective independent claims. *See* App. Br. 24. As such, we sustain the Examiner's rejection of these claims for the reasons discussed above in our analysis of claims 1, 9, and 15.

Claims 6–8, 13, 14, 19, and 20 rejected under 35 U.S.C. § 103(a) as obvious over Moll and Bisschop

Dependent claims 6, 13, and 19 recite a symbolic matrix comprising "a column for each of the variable definitions." Appellants argue that Moll teaches a data model lacking variable definitions, rather than a symbolic matrix, and, therefore, Moll fails to teach a symbolic matrix containing a column for each of the variable definitions. App. Br. 26 (citing Moll ¶¶ 71–74, Fig. 1).

The Examiner finds that Figure 1 of Moll illustrates a data model that includes tables containing resource IDs. Final Act. 16–17 (citing Moll Fig. 1, ¶¶ 71–74, 76–80). The Examiner further finds that the tables of Moll include columns and that the resource IDs are variable definitions. *Id.* A person of ordinary skill in the art would understand that Moll's table includes columns, and that Moll's "resource ID[s] may be [] unique identifier[s]" that define the resource (variable). *See* Moll ¶ 71. Thus, we do not find persuasive Appellants' argument of Examiner error.

Additionally, dependent claims 6, 13, and 19 recite that the symbolic matrix comprises "a row containing an expression for each constraint." Appellants argue that the limitation "a row containing an expression for each constraint" requires the row to contain the actual constraint. App. Br. 27. We disagree with Appellants because Appellants' argument is not commensurate with the scope of the claims. Claims 6, 13, and 19 recite a row containing "an expression" for each constraint, not that the row must contain the actual constraint. Thus, we do not find Appellants' argument that a row must contain the actual constraint persuasive.

Appellants also argue that instead of teaching "a row containing an expression for each constraint," Moll's tables include rows that only reference constraint names. App. Br. 27; Reply Br. 7. We disagree with Appellants.

The Examiner finds that the rows in Bisschop contain the constraint. Final Act. 19 (citing Bisschop 183, 204); Ans. 20 (citing Bisschop 206). The Examiner further finds that a row in Bisschop contains an expression for the constraint because Bisschop teaches that a constraint is a numerical relation containing an expression. Final Act. 19 (citing Bisschop 183); Ans. 20 (citing Bisschop 206). As such, we do not find Appellants' argument persuasive because Bisschop discloses a row containing constraints that also contains expressions for each constraint.

Appellants further contend that the Examiner's motivation to combine Moll and Bisschop is a "mere conclusory statement" absent explanation as to how the software procedures of Bisschop are incorporated into the teachings of Moll. App. Br. 28 (emphasis omitted); Reply Br. 9.

We disagree with Appellants. The Examiner finds that Moll teaches generating a mixed integer linear programming matrix containing constraints. Final Act. 4–7 (citing Moll ¶ 81, Fig. 1); Ans. 11. The Examiner further finds that Bisschop teaches that it was known in the programming art to propagate rows within a data matrix with constraints that contain expressions for each constraint. Final Act. 19 (citing Bisschop 183, 204). The Examiner concludes that it would have been obvious to one of ordinary skill in the art to modify the constraints in Moll's matrix with Bisschop's constraints and the constraints' expressions. *Id.* at 20. The Examiner finds that a person with ordinary skill in the art would have been motivated to make such a combination in order to achieve "the advantage of incorporating the expressions into matrices for evaluations by matrix operations, which easily lend themselves to parallel computation." *Id.* As such, the Examiner provides an articulated reasoning with some rational underpinning to support the conclusion of obviousness. *See KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007) (quoting *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)).

Accordingly, we sustain the Examiner's rejection of dependent claims 6, 13, and 19. Appellants argue that claims 7, 8, 14, and 20, which depend from claims 6, 13, and 19, respectively, are patentable for the same reasons as the claims from which they depend. App. Br. 29. As such, we sustain the Examiner's rejection of these claims for the same reasons discussed above in our analysis of claims 6, 13, and 19.

CONCLUSION

The Examiner did not err in rejecting claims 15–20 under 35 U.S.C. § 101 as being directed to non-statutory subject matter.

The Examiner did not err in rejecting claims 1–5, 9–12, and 15–18 under 35 U.S.C. § 102(b) as being anticipated by Moll.

The Examiner did not err in rejecting claims 6–8, 13, 14, 19, and 20 under 35 U.S.C. § 103(a) as being unpatentable over Moll and Bisschop.

DECISION

To summarize, the rejections of claims 1–20 are affirmed.

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