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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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*Ex parte* ROBERT JAMES CATHERALL,  
ANTHONY NEIL BERENT, RHYS DAVID COPELAND,  
MARK EDGEWORTH, and JONATHAN STEPHEN BLACK

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Appeal 2019-002160  
Application 14/619,881  
Technology Center 2100

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Before JENNIFER S. BISK, AMEE A. SHAH, and  
ROBERT J. SILVERMAN, *Administrative Patent Judges*.

SILVERMAN, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Pursuant to 35 U.S.C. § 134(a), Appellant<sup>1</sup> appeals from the Examiner's decision rejecting claims 1–23. We have jurisdiction under 35 U.S.C. § 6(b).

We REVERSE.

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<sup>1</sup> We use the word “Appellant” to refer to “applicant” as defined in 37 C.F.R. § 1.42. Appellant identifies the real party in interest as ARM LIMITED. Appeal Br. 3.

### CLAIMED SUBJECT MATTER

The Specification states that computing hardware — such as a “graphics processing unit,” for example — “may take several years to develop” and that there is a need to have “application software, driver software and associated complementary hardware all available and tested [and] ready to be used with the graphics processing unit,” “when the graphics processing unit hardware becomes available.” Spec. 2, ll. 13–16. Accordingly, “there is an increasing need for simulation of target hardware before the real hardware becomes available for testing,” because “[s]uch simulation can permit software associated with the target hardware, and complementary hardware intended to operate with the target hardware, to be developed in advance of the target hardware itself being available.” *Id.* at 2, ll. 9–13.

The Specification describes an approach to simulating the performance of a target hardware device being developed:

The present technique recognises that in some circumstances the simulation of a target hardware device may be provided using a primary partial simulation and a complementary partial simulation running in parallel with inputs taken from different levels of abstraction and executing the same processing workload to generate respective first partial result state data and second partial result state data. The technique recognises that there is no need to simulate the operation of the target hardware device from end-to-end but rather that multiple partial simulations may be provided operating in parallel at different levels of abstraction from the target hardware so as to generate respective partial result state data appropriate to their respective levels of abstraction. This can permit other systems to interact with the simulation of the target hardware device so as to verify their own proper

behaviour with a reduced engineering burden associated with the provision of the simulation of the target hardware device.

*Id.* at 4, ll. 2–12.

Independent claim 1, presented below, is representative of the subject matter at issue in this Appeal:

1. A method of simulating execution of a processing workload by a target hardware device including generating result state data, said method comprising the steps of:

providing workload data specifying said processing workload;

passing said workload data both to a primary partial simulation and to a complementary partial simulation running in parallel, the primary partial simulation acquiring input data from a first level of abstraction of said target hardware, the complementary partial simulation acquiring input data from a second level of abstraction of said target hardware, and the first level of abstraction and the second level of abstraction being different from each other;

simulating execution of said processing workload using said primary partial simulation to generate primary partial result state data representing at least part of said result state data; and

simulating execution of said processing workload using said complementary partial simulation to generate complementary partial result state data representing at least part of said result state data.

#### REJECTION

Claims 1–23 are rejected under 35 U.S.C. § 101 as ineligible subject matter.

#### FINDINGS OF FACT

The findings of fact relied upon, which are supported by a preponderance of the evidence, appear in the following Analysis.

## ANALYSIS

### *Legal Principles*

Under 35 U.S.C. § 101, an invention is patent-eligible if it claims a “new and useful process, machine, manufacture, or composition of matter.” 35 U.S.C. § 101. Yet, subject matter belonging to any of the statutory categories may, nevertheless, be ineligible for patenting. The Supreme Court has interpreted § 101 to exclude laws of nature, natural phenomena, and abstract ideas, because they are regarded as the basic tools of scientific and technological work, such that including them within the domain of patent protection would risk inhibiting future innovation premised upon them. *Ass’n for Molecular Pathology v. Myriad Genetics, Inc.*, 569 U.S. 576, 589 (2013).

Of course, “[a]t some level, ‘all inventions . . . embody, use, reflect, rest upon, or apply’” these basic tools of scientific and technological work. *Alice Corp. v. CLS Bank Int’l*, 573 U.S. 208, 217 (2014). Accordingly, evaluating ineligible subject matter, under these judicial exclusions, involves a two-step framework for “distinguish[ing] between patents that claim the buildin[g] block[s] of human ingenuity and those that integrate the building blocks into something more, thereby transform[ing] them into a patent-eligible invention.” *Id.* (citing *Mayo Collaborative Servs. v. Prometheus Labs., Inc.*, 566 U.S. 66, 88–89 (2012)) (internal quotation marks omitted). The first step determines whether the claim is directed to judicially excluded subject matter (such as a so-called “abstract idea”); the second step determines whether there are any “additional elements” recited in the claim that (either individually or as an “ordered combination”) amount to

“significantly more” than the identified judicially excepted subject matter itself. *Id.* at 217–18.

In 2019, the USPTO published revised guidance on the application of § 101, in accordance with judicial precedent. *See* 2019 Revised Patent Subject Matter Eligibility Guidance, 84 Fed. Reg. 50, 52 (Jan. 7, 2019) (“2019 Revised Guidance”). Under the 2019 Revised Guidance, a claim is “directed to” an abstract idea, only if the claim recites any of (1) mathematical concepts, (2) certain methods of organizing human activity, and (3) mental processes — without integrating such abstract idea into a “practical application,” i.e., without “apply[ing], rely[ing] on, or us[ing] the judicial exception in a manner that imposes a meaningful limit on the judicial exception, such that the claim is more than a drafting effort designed to monopolize the judicial exception.” *Id.* at 52–55. The considerations articulated in MPEP § 2106.05(a)–(c) and (e)–(h) bear upon whether a claim element (or combination of elements) integrates an abstract idea into a practical application. *Id.* at 55. A claim that is “directed to” an abstract idea constitutes ineligible subject matter, unless the claim recites an additional element (or combination of elements) amounting to significantly more than the abstract idea. *Id.* at 56.

The 2019 Revised Guidance stands “[i]n accordance with judicial precedent” (*id.* at 52), but enumerates the analytical steps somewhat differently than the Supreme Court’s *Alice* opinion. Step 1 of the 2019 Revised Guidance addresses whether the claimed subject matter falls within any of the statutory categories of § 101. *Id.* at 53–54. Step 2A, Prong One, concerns whether the claim at issue recites ineligible subject matter and, if an abstract idea is recited; Step 2A, Prong Two, addresses whether the

recited abstract idea is integrated into a practical application. *Id.* at 54–55. Unless such integration exists, the analysis proceeds to Step 2B, in order to determine whether any additional element (or combination of elements) amounts to significantly more than the identified abstract idea. *Id.* at 56.

### *Claim Construction*

Although “claim construction is not an inviolable prerequisite” to an analysis under § 101, “a full understanding of the basic character of the claimed subject matter” is, nevertheless, needed to evaluate questions of subject-matter eligibility. *Bancorp Servs., LLC v. Sun Life Assur. Co. of Canada (U.S.)*, 687 F.3d 1266, 1273–74 (Fed. Cir. 2012). *See also McRO, Inc. v. Bandai Namco Games Am. Inc.*, 837 F.3d 1299, 1311 (Fed. Cir. 2016) (“As an initial matter, we note that, in this case, claim construction is helpful to resolve the question of patentability under § 101.”)

In order to assist our analysis, in the present Appeal, we address the construction of certain terms in the phrase (of exemplary independent claim 1) “a primary partial simulation and . . . a complementary partial simulation running in parallel.” (The other independent claims — claims 22 and 23 — employ essentially similar language.)

We understand the claimed “simulation[s]” to refer to the operation of computer hardware and software, so as to imitate the behavior — in regard to the data provided to, and generated by, the respective “simulation” — of the recited “target hardware device.” This understanding follows from the claim language itself, because the term “simulation” is well-understood in computer science to mean the “[i]mitation of the behavior of some existing or intended system, or some aspect of that behavior.” John Daintith et al., *A Dictionary of Computing* (6th ed. 2008) (hereinafter, “Daintith, *Dictionary*

*of Computing*”) (definition of “simulation”). Further, the Specification describes the computer hardware and software components and processes of a “simulation system for simulating the interaction of the application program 2, the operating system 4 and the driver program 6 with the hardware elements [of the central processing unit] 8, [the graphics processing unit] 10, [and the memory] 12 of Figure 1” — e.g., the elements of claim 1’s “target hardware device” being simulated. Spec. 9, ll. 20–22. Thus, claim 1’s “primary partial simulation” and “complementary partial simulation” together comprise the operation of hardware and software, in a manner that imitates the “execution of a processing workload by [the] target hardware device including generating result state data.” These operations are accomplished by the claimed “primary partial simulation” and “complementary partial simulation” operating on different portions of the “workload data.” *See id.* at 9, l. 20 – 11, l. 10. For example, as explained in the Specification:

The primary partial simulation 22 operates in parallel with the complementary partial simulation 14, but acquires its input data from a different level of abstraction. More particularly, the driver program 6 outputs commands to the primary partial simulation 22 corresponding to those which would be output from the driver program 6 to the graphics processing unit 10 in Figure 1. The driver program 6 and the operating system 4 also interact with each other and with the primary partial simulation 22 to provide input data to the primary partial simulation 22, such as data indicating memory regions which have been allocated for use by the simulated target hardware device, servicing interrupt behaviour such as processing software interrupts and interrupts indicating progress through the workload as may be generated by the primary partial simulation 22 to coordinate action with the

complementary partial simulation 14 and to correspond to the behaviour of the real graphics processing unit 10.

*Id.* at 10, ll. 4–14.

Next, we understand the phrase “running in parallel” to refer to the simultaneous operation of the respective hardware and software of the “primary partial simulation” and the “complementary partial simulation,” with regard to respective “input data from a first level of abstraction of said target hardware” and “input data from a second level of abstraction of said target hardware,” so as to “generate” the respective “primary partial result state data” and “complementary partial result state data representing.” This understanding follows from the claim language itself, because the term “parallel” is well-understood in computer science to “[i]nvolv[e] the simultaneous transfer or processing of the individual parts of a whole.” Daintith, *Dictionary of Computing* (definition of “parallel”). The Specification lends further support to our understanding, by describing the role of “marker data” that “correspond[s] to positions within the processing of the workload data reached at particular points so that the parallel execution of the complementary partial simulation 14 and the primary partial simulation 22 may be kept in sufficient synchronism.” Spec. 11, ll. 4–8. This reference to “synchronism” speaks to the temporal simultaneity involved in the claimed “primary partial simulation” and “complementary partial simulation” “running in parallel.”

Finally, we note that the independent claims in the Appeal employ the word “abstraction,” for example, in claim 1’s recitation of “the primary partial simulation acquiring input data from a first level of abstraction of said target hardware, the complementary partial simulation acquiring input

data from a second level of abstraction of said target hardware.” Although the expression “abstract idea,” along with related words, have acquired specialized meaning in patent law, in regard to issues of subject-matter eligibility, the use of the term “abstraction,” in the present claims, does not color our analysis of the rejection under consideration. The term “abstraction” of the claims relates to a familiar practice in computer science:

The principle of ignoring those aspects of a subject that are not relevant to the current purpose in order to concentrate solely on those that are. The application of this principle is essential in the development and understanding of all forms of computer system.

Daintith, *Dictionary of Computing* (definition of “abstraction”). Thus, the claimed “abstraction[s]” concern the different types of “input data,” of the “workload data,” that are provided to the respective “primary partial simulation” and “complementary partial simulation.” This understanding aligns with the use of the word “abstraction” (and variants thereof) in the Specification. *See* Spec. 4, ll. 20–23 (“It is becoming increasingly common for processing workloads to be specified in a way abstracted from the hardware which will execute those processing workloads in order to make the processing workloads more portable between different hardware implementations.”) *See also id.* at 6, ll. 25–28 (“The increasing use of abstraction in specifying processing workloads has the result that in many instances, an existing host processing device that is able to execute at least part of the processing workload as a native workload will already exist and can be used efficiently to provide at least part of the complementary partial simulation.”)

Accordingly, the appearance of the word “abstraction,” in the claims, does not bear upon the patent-eligibility of the claimed subject matter, or whether any portion of it constitutes an “abstract idea.” Law is not so formalistic that the usage of a word, in one context, would mandate a particular outcome, in another. *See Yates v. U.S.*, 574 U.S. 528, 537 (2015) (“In law as in life, . . . the same words, placed in different contexts, sometimes mean different things.”); *Secure Access, LLC v. PNC Bank Nat’l Ass’n*, 848 F.3d 1370, 1381 (Fed. Cir. 2017) (“To be clear: the phrasing of a qualifying claim[, for PTAB review of a Covered Business Method (CBM),] does not require particular talismanic words. When properly construed in light of the written description, the claim need only require one of a ‘wide range of finance-related activities,’ examples of which can be found in the cases which we have held to be within the CBM provision.”) (citations omitted); *In re Gelnovatch*, 595 F.2d 32, 46 (CCPA 1979) (Markey, C.J., dissenting) (“Each so-called ‘computer program’ case, like all cases turning on the nature of an invention, must be decided not on a rubric but on its own facts. In reviewing a rejection under § 101, the controlling facts must be developed from careful and detailed analysis of the invention as described and claimed. The Supreme Court and this court have made just such analyses in the ‘computer program’ cases thus far presented. It is just such analysis that the PTO must make in each such case. That analysis includes a determination of the meaning of computer-world terms, and the role and effect of the elements or steps for which they stand, in the context of the invention as a whole. Justice requires that employment of labels, rubrics, and talismans, be eschewed.”) (footnotes omitted).

*Subject-Matter Eligibility*

Regarding Step 1 of the 2019 Revised Guidance, the Examiner does not determine that any claim in the Appeal lies outside the statutory categories of § 101. The foregoing claim constructions confirm the Examiner’s position. Independent claim 1 provides “[a] method of simulating execution of a processing workload by a target hardware device,” performed through the operation of hardware and software. Thus, claim 1 is drawn to a “process,” per 35 U.S.C. § 101. Independent claim 22 provides an “[a]pparatus for executing a processing workload specified by workload data to generate result state data in place of a target hardware device” — i.e., a combination of particularly configured hardware and software elements. In the terminology of § 101, claim 22 is drawn to a “machine.” The remaining independent claim (claim 23) recites “[a] non-transitory computer-readable storage medium, having computer-executable instructions stored thereon” — a “manufacture,” in the language of § 101, that explicitly avoids the defect addressed in *In re Nuijten*, 500 F.3d 1346 (Fed. Cir. 2007) (holding that a transitory propagating signal is outside the statutory invention categories of § 101).

The Examiner’s analysis corresponding to Step 2A, Prong One, of the 2019 Revised Guidance identifies the following limitations of independent claim 1: “providing workload data specifying said processing workload”; “passing said workload data both to a primary partial simulation and to a complementary partial simulation running in parallel, the primary partial simulation acquiring input data from a first level of abstraction of said target hardware, the complementary partial simulation acquiring input data from a second level of abstraction of said target hardware, and the first level of

abstraction and the second level of abstraction being different from each other”; “simulating execution of said processing workload using said primary partial simulation to generate primary partial result state data representing at least part of said result state data”; and “simulating execution of said processing workload using said complementary partial simulation to generate complementary partial result state data representing at least part of said result state data.” Final Action 4–5. According to the Examiner, these limitations are “similar to the abstract idea of collecting information, analyzing it, and displaying certain results of the collection and analysis.” *Id.* at 5 (citing *Elec. Power Grp., LLC v. Alstom, S.A.*, 830 F.3d 1350 (Fed. Cir. 2016)).

More specifically, in comparing the identified claim limitations to the abstract idea characterization of *Electric Power Group*, the Examiner states: “[t]he recitation of ‘providing workload data . . .’ and passing workload data to run simulations in parallel are similar to information being collected”; “the recitation of the input data acquired from different levels of abstraction describing the location of where the data is collected, while simulating the workload using both the primary and complimentary simulations are steps of analysis performed regarding the workload data”; and “the results of the simulations are steps of displaying the certain results of the collection and analysis.” *Id.*

Viewed through the lens of the 2019 Revised Guidance, we understand the Examiner’s characterization of the abstract idea — “collecting information, analyzing it, and displaying certain results of the collection and analysis” (Final Action 5) — to be a form of mental process, i.e., “concepts performed in the human mind (including an observation,

evaluation, judgment, opinion).” 2019 Revised Guidance, 84 Fed. Reg. at 52 (footnotes omitted). The USPTO also presented this same determination, in the October 2019 Update: Subject Matter Eligibility, 7 (Oct. 17, 2019)<sup>2</sup> (*Electric Power Group*’s recitation of “collecting information, analyzing it, and displaying certain results of the collection and analysis,’ where the data analysis steps are recited at a high level of generality such that they could practically be performed in the human mind” describes an abstract idea in the mental process category). Indeed, the Federal Circuit, in *Electric Power Group*, describes the activities of collecting, analyzing, and displaying data, as recited in the claims before the court, as a type of mental process:

Information as such is an intangible. Accordingly, we have treated collecting information, including when limited to particular content (which does not change its character as information), as within the realm of abstract ideas. In a similar vein, we have treated analyzing information by steps people go through in their minds, or by mathematical algorithms, without more, as essentially mental processes within the abstract-idea category. And we have recognized that merely presenting the results of abstract processes of collecting and analyzing information, without more (such as identifying a particular tool for presentation), is abstract as an ancillary part of such collection and analysis.

*Elec. Power Grp.*, 830 F.3d at 1353–54 (citations omitted).<sup>3</sup>

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<sup>2</sup> Available at [https://www.uspto.gov/sites/default/files/documents/peg\\_oct\\_2019\\_update.pdf](https://www.uspto.gov/sites/default/files/documents/peg_oct_2019_update.pdf).

<sup>3</sup> Although the Federal Circuit explicitly states that it has “treated analyzing information by steps people go through in their minds, or by mathematical algorithms, without more, as essentially mental processes within the abstract-idea category,” *Elec. Power Grp.*, 830 F.3d at 1354, the Court’s terse discussion might appear to suggest that the claimed “collecting” and

However, the Examiner’s analysis of claim 1 in the present Appeal (Final Action 5) does not fit well into the abstract-idea model that is provided in *Electric Power Group*.

Notably, the claims at issue in *Electric Power Group* are remarkable for their lack of detail — particularly as to what constitutes the claimed “analyzing” and “displaying.” *Elec. Power Grp.*, 830 F.3d at 1352. The Federal Circuit points out that the *Electric Power Group* claims fail to recite what type of “analy[sis]” would be performed and how this might be accomplished, nor did the claims delineate any particular technique or instrumentality for “displaying” the results:

Though lengthy and numerous, the claims do not go beyond requiring the collection, analysis, and display of available information in a particular field, stating those functions in general terms, without limiting them to technical means for performing the functions that are arguably an advance over conventional computer and network technology.

*Id.* at 1351. *See also id.* at 1355 (“The claims in this case do not even require a new source or type of information, or new techniques for analyzing it.”) (citations omitted). Additionally, our reviewing court explains:

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“displaying” steps — whether individually or in combination with the “analyzing” step — could involve something other than mental processes. Yet, the Federal Circuit (*id.* at 1353–1354) relies upon case law that describes mental-process abstract ideas, in characterizing the features of “collecting” (citing *Content Extraction & Transmission LLC v. Wells Fargo Bank, Nat’l Ass’n*, 776 F.3d 1343, 1347 (Fed. Cir. 2014) and *CyberSource Corp. v. Retail Decisions, Inc.*, 654 F.3d 1366, 1370 (Fed. Cir. 2011)) and “displaying” (i.e., “presenting the results of abstract processes”) (citing *Content Extraction*, 776 F.3d at 1347). Moreover, the Federal Circuit characterizes the aggregate of collecting/analyzing/displaying (at issue in the claims before the court) as being among “ordinary mental processes.” *Elec. Power Grp.*, 830 F.3d at 1355.

a large portion of the lengthy claims is devoted to enumerating types of information and information sources available within the power-grid environment. But merely selecting information, by content or source, for collection, analysis, and display does nothing significant to differentiate a process from ordinary mental processes, whose implicit exclusion from § 101 undergirds the information-based category of abstract ideas.

*Id.* at 1355. Accordingly, the court in *Electric Power Group*, in describing the shortcomings of the claims at issue in that case, repeatedly invokes the caveat “without more,” in order to emphasize the unusually spare nature of the claims before the court — in regard to the very features that would need to be more fulsome, in order to avoid the pitfall of subject-matter ineligibility. *Id.* at 1354 (“[W]e have treated analyzing information by steps people go through in their minds, or by mathematical algorithms, *without more*, as essentially mental processes within the abstract-idea category”; “[W]e have recognized that merely presenting the results of abstract processes of collecting and analyzing information, *without more* (such as identifying a particular tool for presentation), is abstract as an ancillary part of such collection and analysis”; “Most obviously, limiting the claims to the particular technological environment of power-grid monitoring is, *without more*, insufficient to transform them into patent-eligible applications of the abstract idea at their core.”) (emphasis added).

In contrast to the claims in *Electric Power Group*, the portions of the Appellant’s claims that the Examiner characterizes as corresponding to mere “collecting,” “analyzing,” and “displaying” (*see* Final Action 5) involve significant complexity — reciting, for example, in claim 1:

a primary partial simulation and to a complementary partial simulation running in parallel, the primary partial simulation acquiring input data from a first level of abstraction of said

target hardware, the complementary partial simulation acquiring input data from a second level of abstraction of said target hardware, and the first level of abstraction and the second level of abstraction being different from each other;

simulating execution of said processing workload using said primary partial simulation to generate primary partial result state data representing at least part of said result state data; and

simulating execution of said processing workload using said complementary partial simulation to generate complementary partial result state data representing at least part of said result state data.

Contrary to the Examiner's position (*see* Final Action 5), these steps involve far more than the unspecified "collecting information, analyzing it, and displaying certain results of the collection and analysis" of the claims in *Electric Power Group*, 830 F.3d at 1353. Claim 1 recites, for example, two "partial simulation[s]" "running in parallel," with each employing "input data" from different "level[s] of abstraction of [the] target hardware," thereby generating corresponding "primary partial result state data" and "complementary partial result state data." In equating the identified claim language to no more than "collecting information, analyzing it, and displaying certain results of the collection and analysis," the Examiner contravenes the Federal Circuit's admonition to "'avoid oversimplifying the claims' by looking at them generally and failing to account for the specific requirements of the claims." *McRO*, 837 F.3d at 1313 (citing *In re TLI Commc 'ns LLC Patent Litig.*, 823 F.3d 607, 611 (Fed. Cir. 2016) and *Diamond v. Diehr*, 450 U.S. 175, 189 n.12 (1981)).<sup>4</sup>

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<sup>4</sup> In addition, and contrary to the Examiner's determination, there is no recitation in claim 1 that corresponds to the "displaying" feature in *Electric Power Group*. The Examiner states that "the results of the simulations are

More fundamentally than the dissimilarity between the claims in the instant Appeal and those in *Electric Power Group*, there is inadequate support for a determination that the identified features of the claims could “be performed in the human mind, or by a human using a pen and paper” (*CyberSource*, 654 F.3d at 1372)— the *sine qua non* of mental processes judicially excepted from patent eligibility:

Methods which can be performed entirely in the human mind are unpatentable not because there is anything wrong with claiming mental method steps as part of a process containing non-mental steps, but rather because computational methods which can be performed *entirely* in the human mind are the types of methods that embody the “basic tools of scientific and technological work” that are free to all men and reserved exclusively to none.

*Id.* at 1373 (quoting *Gottschalk v. Benson*, 409 U.S. 63, 67 (1972)) (footnote omitted). *See also In re Comiskey*, 554 F.3d 967, 980 (Fed. Cir. 2009) (“[T]he patent statute does not allow patents on particular systems that depend for their operation on human intelligence alone, a field of endeavor that both the framers and Congress intended to be beyond the reach of patentable subject matter. Thus, it is established that the application of human intelligence to the solution of practical problems is not in and of itself patentable.”)

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steps of displaying the certain results of the collection and analysis.” Final Action 5. Although the claimed simulations are performed, so as to “generate” “primary partial result state data representing at least part of said result state data” and “complementary partial result state data representing at least part of said result state data,” claim 1 the claim does not recite any displaying activity separate from what the Examiner equates to “analyzing” in *Electric Power Group*. *See* Final Action 5.

The Federal Circuit’s mental-process inquiry focuses on whether subject matter could, “as a practical matter, be performed entirely in a human’s mind.” *CyberSource*, 654 F.3d at 1376. Likewise, the 2019 Revised Guidance emphasizes whether “the claim cannot practically be performed in the mind.” 2019 Revised Guidance, 84 Fed. Reg. at 52 n.14. The Office has endeavored to clarify the proper role of the pen-and-paper analogy, in particular, explaining that “[t]he use of pen and paper to help perform a mental step simply accounts for variations in memory capacity from one person to another and should not be used to expand the scope of the mental processes grouping.” October 2019 Update: Subject Matter Eligibility, 20 n.58.

In order to evaluate whether particular claimed subject matter could be performed mentally, courts have relied upon evidence and/or reasoning, in various forms.

For example, the claim language itself might be capable of a construction that encompasses mental performance. *See SmartGene, Inc. v. Advanced Biological Labs., SA*, 555 F. App’x 950, 955 (Fed. Cir. 2014) (nonprecedential) (“The claim does not purport . . . to identify any steps beyond those which doctors routinely and consciously perform. Our ruling is limited to the circumstances presented here, in which every step is a familiar part of the conscious process that doctors can and do perform in their heads.”) *See also CyberSource*, 654 F.3d at 1373 (discussing claim language “so broadly worded that it encompasses literally *any* method for detecting fraud based on the gathered transaction and Internet address data. This necessarily includes even logical reasoning that can be performed entirely in the human mind.”) (citation omitted).

The Specification may reveal that claimed subject matter can be accomplished mentally. *See In re Meyer*, 688 F.2d 789, 795 (CCPA 1982) (“Appellants’ specification and arguments indicate that their invention is concerned with replacing, in part, the thinking processes of a neurologist with a computer.”)

Additionally, the Appellant’s arguments may disclose that claimed subject matter can be accomplished mentally. *See In re Rudy*, 956 F.3d 1379, 1384 (Fed. Cir. 2020) (“Indeed, Mr. Rudy concedes in his brief that ‘all that is required of the angler is observation, measuring, and comparison with a predetermined chart.’ As Mr. Rudy continued, ‘even a fish can distinguish and select colors . . . the fisherman can do this too.’”) (citations omitted); *In re Meyer*, 688 F.2d at 795 (“Counsel for appellants acknowledged in oral argument that the claims recite a mathematical algorithm, which represents a mental process that a neurologist should follow.”) (footnote omitted).

Further, courts have relied upon evidence of actual mental performance of the claimed subject matter. *See Synopsys, Inc. v. Mentor Graphics Corp.*, 839 F.3d 1138, 1148 (Fed. Cir. 2016) (“Although an understanding of logic circuit design is certainly required to perform the steps, the limited, straightforward nature of the steps involved in the claimed method make evident that a skilled artisan could perform the steps mentally. The inventors of the Gregory Patents confirmed this point when they admitted to performing the steps mentally themselves. . . . Representative claim 1 is directed to generating a representation of a single specific hardware component and can be — and was — performed mentally or with pencil and paper.”) (citation omitted); *CyberSource*, 654 F.3d at 1373

(“CyberSource’s CEO admitted that, before CyberSource created a computer implemented fraud detection system, ‘[w]e could see just by looking that more than half of our orders were fraudulent.’”) (citation omitted).

Expert testimony may also illuminate the issue. Judge Bryson of the Federal Circuit, presiding in a district court litigation, determined that such expert testimony was sufficient to defeat a motion for summary judgment:

The question whether a pseudo-random number generator can be devised that relies on an algorithm that can be performed mentally, or readily with pencil and paper, is one such factual question that would have to be resolved before the Court could grant summary judgment of invalidity in this case. While the defendants assert that the encryption and decryption process can be performed in the human mind or with pencil and paper, TQP has offered evidence to the contrary, in the form of an expert’s declaration stating that a person of skill in the art would understand that the claimed method could not be performed in the mind but would require the use of a machine. That factual dispute by itself is enough to foreclose the entry of summary judgment in the defendants’ favor on the present record.

*TQP Dev., LLC v. Intuit Inc.*, No. 2:12-cv-180-WCB, 2014 WL 651935, at \*5 (E.D. Tex. Feb. 19, 2014) (Bryson, J., sitting by designation).

By contrast, lacking evidence of mental performance, the Federal Circuit has upheld the validity of claims challenged, as ineligible subject matter. *See SiRF Tech., Inc. v. Int’l Trade Comm’n*, 601 F.3d 1319, 1333 (Fed. Cir. 2010) (“[T]here is no evidence here that the calculations here can be performed entirely in the human mind.”)

Although stated in simple terms, ascertaining whether a human being can perform a particular task mentally (including with the aid of pen and paper) can remain difficult to assess. *See Cal. Inst. of Tech. v. Hughes Commc’ns Inc.*, 59 F. Supp. 3d 974, 995 (C.D. Cal. 2014) (“The problems of

pencil-and-paper analysis are heightened in the context of software, which necessarily uses algorithms to achieve its goals. Pencil-and-paper analysis can mislead courts into ignoring a key fact: although a computer performs the same math as a human, a human cannot always achieve the same results as a computer.”)

However, courts have provided various examples of the types of activities, deemed judicially excepted subject matter, that can be performed mentally — notwithstanding whether such activities might also be characterized as another type of abstract idea.

The act of comparing one thing to another, including the comparison of an observed item to a predetermined standard, has been regarded as a mental process. *See In re Rudy*, 956 F.3d at 1384 (comparing measured or observed features, of a body of water, to descriptions in a chart provided in the claim, for identifying a corresponding fish hook color, constituted a mental process); *In re BRCA1- and BRCA2-Based Hereditary Cancer Test Patent Litig.*, 774 F.3d 755, 763 (Fed. Cir. 2014) (comparing one sequence of nucleotides to another and identifying differences between them, regarded as a mental process) (citation omitted); *PerkinElmer, Inc. v. Intema Ltd.*, 496 F. App’x 65, 70 (Fed. Cir. 2012) (nonprecedential) (“The claims . . . recite the mental process of comparing data to determine a risk level: data are gathered in the first trimester of pregnancy; data are gathered in the second trimester of pregnancy; those data are compared to known statistical information.”)

Creating and using classifications (i.e., for organization or retrieval) has been regarded as an abstract idea. *See Intellectual Ventures I LLC v. Erie Indemnity Co.*, 850 F.3d 1315, 1327 (Fed. Cir. 2017) (“[T]he invention

is drawn to the abstract idea of ‘creating an index and using that index to search for and retrieve data.’”) (citation omitted); *In re TLI Commc ’ns*, 823 F.3d at 611–12 (“[R]epresentative claim 17 is drawn to the concept of classifying an image and storing the image based on its classification.”)

The process of “encoding and decoding” has also been treated as “an abstract concept long utilized to transmit information.” *RecogniCorp, LLC v. Nintendo Co., Ltd.*, 855 F.3d 1322, 1326 (Fed. Cir. 2017) (“Morse code, ordering food at a fast food restaurant via a numbering system, and Paul Revere’s ‘one if by land, two if by sea’ signaling system all exemplify encoding at one end and decoding at the other end.”) (citations omitted).

Additionally, some mathematical calculations may be amenable to such mental performance. *See Parker v. Flook*, 437 U.S. 584, 595 (1978) (“[I]f a claim is directed essentially to a method of calculating, using a mathematical formula, even if the solution is for a specific purpose, the claimed method is nonstatutory.”) (citing *In re Richman*, 563 F.2d 1026, 1030 (CCPA 1977)); *Benson*, 409 U.S. at 67 (“The conversion of [binary coded decimal] numerals to pure binary numerals can be done mentally.”); *Coffelt v. NVIDIA Corp.*, 680 F. App’x 1010, 1011 (Fed. Cir. 2017) (nonprecedential) (“‘[C]alculating a . . . steradian region of space,’ as recited in claim 1, is a purely arithmetic exercise. The claims thus recite nothing more than a mathematical algorithm that could be implemented using a pen and paper.”) (citation omitted).

Even claims explicitly reciting the use of a computer may, nevertheless, include an abstract concept that can be performed mentally. *See Mortg. Grader, Inc. v. First Choice Loan Servs. Inc.*, 811 F.3d 1314, 1324 (Fed. Cir. 2016) (holding that a computer-implemented method for

“anonymous loan shopping” was an abstract idea, because the claimed steps of applying for a loan, calculating credit grading, and providing pricing information “could all be performed by humans without a computer”) (citations omitted); *Versata Dev. Grp., Inc. v. SAP Am., Inc.*, 793 F.3d 1306, 1335 (Fed. Cir. 2015) (“Courts have examined claims that required the use of a computer and still found that the underlying, patent-ineligible invention could be performed via pen and paper or in a person’s mind.”) (citations omitted).

With regard to the present Appeal, the Appellant argues that the limitations of claim 1, which the Examiner identifies as describing an abstract idea, cannot be performed mentally. Appeal Br. 14–15. Specifically, according to the Appellant, “a human being cannot run a primary partial simulation and a complementary partial simulation in parallel to simulate execution of a processing workload by a target hardware device.” *Id.*

Although the Appellant’s assertion is presented in the form of attorney argument, the Examiner does not show that those claim limitations, which are said to identify an abstract idea (*see, e.g.*, Final Action 4–5), describe a mental process. The Examiner neither contradicts nor rebuts the Appellant’s position (*see* Appeal Br. 14–15) that running a “primary partial simulation” and a “complementary partial simulation” “in parallel” (i.e., simultaneously, as explained above), as per claim 1, is beyond human mental capacity (without the aid of the claimed computer functionality, as the claims are construed herein). Instead, the Examiner counters that these limitations are

not described, in the Specification, as reducing an engineering burden.

Answer<sup>5</sup> 23 (citing Spec. 4, ll. 1–12).

The Examiner’s position, here, might be related to whether or not these claimed features effect a technological improvement, which may be considered under Step 2A, Prong Two, of the analytical approach presented in the 2019 Revised Guidance. Yet, the Examiner does not address (in the Answer or elsewhere) the more basic question of whether the claimed features at issue could be practiced mentally, such that they may be characterized as an abstract idea in the form of a mental process — an inquiry corresponding to Step 2A, Prong One, of the 2019 Revised Guidance. Therefore, the Examiner does not adequately explain why the identified features of independent claim 1 would recite an abstract idea.

Furthermore, neither the language of claim 1, nor the Specification, indicates that a human (even with the aid of pen and paper) might be able to perform both “a primary partial simulation” and a “complementary partial simulation,” based upon respective “input data” (which are “different from each other”), “in parallel.” Even if conducting the recited individual “simulation[s]” were treated as activities that could be performed in the human mind, the claimed requirement that they be performed “in parallel” (i.e., simultaneously) differs fundamentally from the types of behaviors (such as those discussed above) that have been regarded as human mental processes. Consequently, contrary to the rejection in this Appeal, independent claim 1 does not recite an abstract idea in the form of a mental process, according to Step 2A, Prong One, of the 2019 Revised Guidance.

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<sup>5</sup> We refer to the Examiner’s Answer dated November 29, 2018. (An earlier version of this paper is dated November 15, 2018.)

Although not raised by the Examiner, claim 1 does not recite subject matter belonging to other categories of abstract ideas identified in the 2019 Revised Guidance. Claim 1 does not recite an abstract idea belonging to the category of “[m]athematical concepts,” because the claim does not recite “mathematical relationships, mathematical formulas or equations, [or] mathematical calculations.” 2019 Revised Guidance, 84 Fed. Reg. at 52. Nor does claim 1 recite subject matter corresponding to any of the ineligible “[c]ertain methods of organizing human activity.” *Id.* (referring to “fundamental economic principles or practices,” “commercial or legal interactions,” and “managing personal behavior or relationships or interactions between people”).

The foregoing analysis applies equally to the other independent claims (claims 22 and 23), which recite essentially similar limitations to those of claim 1 discussed herein. Therefore, without any need to address the other steps in the 2019 Revised Guidance, we do not sustain the rejection of claims 1–23 under 35 U.S.C. § 101.

#### CONCLUSION

In summary:

<b>Claims Rejected</b>	<b>35 U.S.C. §</b>	<b>Reference(s)/Basis</b>	<b>Affirmed</b>	<b>Reversed</b>
1–23	101	Eligibility		1–23

REVERSED