SOFTWARE PATENTING AND SECTION 101'S GATEKEEPING FUNCTION

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INTRODUCTION

Software-related inventions have had an uneasy relationship with the patent-eligible subject matter requirement of Section 101 of the Patent Act.[1] In applying the requirement, the Supreme Court has historically characterized mathematical algorithms and formulas *simpliciter* as sufficiently analogous to laws of nature to warrant judicial exclusion as abstract ideas.[2] The Court has also found "the mere recitation of a generic computer" in a patent claim as tantamount to "adding the words 'apply it with a computer,'" a mere drafting effort that does not relieve "the pre-emption concern that undergirds our § 101 jurisprudence."[3] Lower courts, patent counsel and commentators have struggled to apply these broad principles to specific software-related inventions, a difficulty largely rooted in the many forms and levels of abstraction in which mathematical algorithms can be situated, both in the computing context and in the terms of a patent claim.[4] Consequently, widely varying approaches to claiming inventions that involve algorithms in their use have perennially complicated efforts to develop a coherent doctrine of unpatentable abstract ideas.

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[1] *See* 35 U.S.C. § 101 ("Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.").

[2] *See* Parker v. Flook, 437 U.S. 584, 590 (1978) (citing Gottschalk v. Benson, 409 U.S. 409 U.S. 63, 67 (1972)) ("Reasoning that an algorithm, or mathematical formula, is like a law of nature, *Benson* applied the established rule that a law of nature cannot be the subject of a patent.").

[3] *See* Alice Corp. v. CLS Bank Int'l, 134 S.Ct. 2358 (2014) (citing Mayo Collab. Svcs. v. Prometheus Labs., 132 S.Ct. 1289, 1294-1301 (2012)).

[4] *See, e.g.,* Jeffrey A. Lefstin, *The Three Faces of Prometheus: A Post-Alice Jurisprudence of Abstractions*, 16 N.C. J. L. & TECH. 688 (2015) ("The pivotal question … perhaps for software patents more generally, is whether specific information-processing techniques are abstract ideas."); *see generally* JAMES BESSEN & MICHAEL J. MEURER, PATENT FAILURE: HOW JUDGES, BUREAUCRATS AND LAWYERS PUT INNOVATORS AT RISK 201 (2008) (arguing that "the abstractness of software technology inherently makes it more difficult to place limits on abstract claims in software patents").

In the computing context, the term "algorithm" can refer to any "finite sequence of steps" that accomplishes a given task.[5] As an algorithm is usually described in the computer science literature, it is common for some or all of the "steps" themselves to be tasks that can be decomposed further into sequences of more basic steps. A computer system thereby typically involves numerous "abstraction layers," with each successive, more abstract, layer implementing its own set of functions through various algorithms comprising sequences of functions previously implemented by the more concrete layers below.[6] To make matters even more complicated, abstraction layers often provide multiple distinct implementations and interpretations of a single function, using a versatile programming technique known as "indirection."[7] For example, the FreeBSD operating system uses indirection to implement a single "read system call" operation on disparate filesystem organizations such as those in PC hard drives, CD-ROMs, and USB sticks.[8]

As of this writing, the Senate Judiciary Subcommittee on Courts, Intellectual Property and the Internet is considering draft legislation to overhaul existing law relating to patent-eligible subject matter, *inter alia*, by specifying that (1) "the provisions of section 101 shall be construed in favor of eligibility," (2) "no implicit or other judicially created exceptions to subject matter eligibility … shall be used to determine patent eligibility under section 101, and all cases establishing or interpreting those exceptions to eligibility are hereby abrogated," and (3) "eligibility … under section 101 shall be determined without regard to … any other considerations relating to sections 102, 103, or 112."[9] According to the bill's drafters, the new statute codifies the principle that "statutory

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[5] *See* MICROSOFT COMPUTER DICTIONARY 19 (1999) (defining "algorithm" as "[a] finite sequence of steps for solving a logical or mathematical problem or performing a task").

[6] *See* ANDREW S. TANENBAUM, STRUCTURED COMPUTER ORGANIZATION (1979).

[7] *See* Diomidis Spinellis, *Another Level of Indirection*, *in* BEAUTIFUL CODE: LEADING PROGRAMMERS EXPLAIN HOW THEY THINK 279–291 (Andy Oram & Greg Wilson, eds. 2007). Indirection is such a versatile approach to abstracting away implementation details that the claim that "[a]ll problems in computer science can be solved with another layer of indirection" has become a well-known aphorism among programmers. *See id.* at 279.

[8] *See id.* at 279-82.

[9] *See* Thom Tillis, *Sens. Tillis and Coons and Reps. Collins, Johnson, and Stivers Release Draft Bill Text to Reform Section 101 of the Patent Act*, Press Release (May 22, 2019), https://www.tillis.senate.gov/2019/5/sens-tillis-and-coons-and-reps-collins-johnson-and-stivers-release-draft-bill-text-to-reform-section-101-of-the-patent-act (hereinafter "Draft Bill Text").

exceptions should be the only basis for excluding inventions from eligibility and courts may not expand them."[10] The text of the proposed statute, however, simply recites the already existing categories of statutory subject matter (process, machine, manufacture, composition of matter, improvement) without any mention of exceptions while specifying that patentable utility requires "specific and practical utility in any field of technology through human intervention."[11]

As the judicially created exceptions from patent-eligible subject matter hang in the balance, it is a critical time to examine the form and function of the courts' patent-eligibility jurisprudence to date, particularly in the software field. This chapter identifies and reviews three conceptually divergent judicial approaches to the patent-eligibilty of software-related inventions.

Part I of this chapter examines courts' efforts in past decades to ground the eligibility of some software-related inventions in the statutory category of "new and useful … machine[s]."[12] This approach was problematic insofar as it tended to obscure considerations of the underlying mathematical algorithm in other aspects of the patentability analysis. The proposed legislation would likely send courts down this road again, in that software-related inventions would fall under the "process" and "machine" statutory categories, with a general-purpose computer programmed to perform any practical function being eligible as a "machine."

Part II describes and critiques the current framing of preemption as the central concern necessitating the judicial exclusion of certain software-related inventions. This preemption concern neither accurately captures the rationale for judicial exclusion nor provides adequate guidance regarding the eligibility of software-related claims.

Part III highlights the judicial exclusions' historic and enduring role in obviating other patentability inquiries that would be inapposite as applied to the claimed subject matter. This gatekeeping function represents an independently sufficient, jurisprudential, rationale for the patent-eligible subject matter requirement and provides a precise criterion by which examiners and courts can distinguish between abstract ideas and their practical applications in the field of computing.

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[10] *See* Thom Tillis, *Tillis, Coons Vet Patent Eligibility Bill Principles with Stakeholders*, Press Release (Mar. 27, 2019), https://www.tillis.senate.gov/2019/3/tillis-coons-vet-patent-eligibility-bill-principles-with-stakeholders.

[11] *See* Tillis, Draft Bill Text, *supra* note 9.

[12] *See* 35 U.S.C. § 101.

The chapter concludes with recommendations.

I. THE "NEW MACHINE" PRINCIPLE

Despite the importance of *In re Bernhart*[13] to the histories both of software patents and of computer technology, it has received little attention in contemporary debates over the patenting of software. But the "new machine" principle it articulated continued to hold legal significance for nearly four decades.

In 1961, Boeing employees Walter Bernhart and Bill Fetter filed a patent application[14] for a computer system capable of drawing two-dimensional representations of three-dimensional objects. Bernhardt and Fetter, who is credited with coining the term "computer graphics,"[15] would have to wait eight years for the U.S. Court of Customs and Patent Appeals to award them their patent.[16] Hundreds of firms, including Disney, expressed interest in licensing the technology,[17] and Computerworld heralded the issued patent as "the first true software patent."[18]

Bernhart and Fetter's claimed system included a "general-purpose digital computer" programmed to calculate a series of coordinates $\{(v_i, w_i)\}$ representing the projections of object points $\{(x_i, y_i, z_i)\}$ from a viewpoint (x_e, y_e, z_e) onto the plane located at k times the distance from the viewpoint to the origin and normal to the line between them. The calculation was to be based on the formulas:

$$v_i = \frac{k(x_e^2 + y_e^2 + z_e^2)(-y_e x_i + x_e y_i)}{\sqrt{(x_e^2 + y_e^2)}\left[(x_e^2 + y_e^2 + z_e^2) - (x_e x_i + y_e y_i + z_e z_i)\right]}$$

$$w_i = \frac{k\sqrt{(x_e^2 + y_e^2 + z_e^2)}}{\sqrt{(x_e^2 + y_e^2)}}\left(\frac{-x_e z_e x_i - y_e z_e y_i + z_i(x_e^2 + y_e^2)}{(x_e^2 + y_e^2 + z_e^2) - (x_e x_i + y_e y_i + z_e z_i)}\right)$$

The system also included a planar "plotting machine" for plotting the points $\{(v_i, w_i)\}$ on paper. The "plotting machine" could use any known output technology for this purpose, including ink pens, cathode ray photography, or electrostatic paper.

The Patent Office had rejected the system claims under § 101 because

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[13] In re Bernhart, 417 F.2d 1395 (C.C.P.A. 1969).
[14] U.S. Patent 3,519,997 (filed Nov. 13, 1961).
[15] 39 COMM. ARTS MAG. 216 (1997).
[16] In re Bernhart, 417 F.2d 1395 (C.C.P.A. 1969).
[17] *Firm Wins Battle for Mechanical Cartoonist Patent*, GREAT BEND DAILY TRIB., May 1, 1970, at 1.
[18] COMPUTERWORLD, July 29, 1970, at 2.

their point of novelty consisted of the mathematical equations used to program the computer.[19] On appeal, the U.S. Court of Customs and Patent Appeals acknowledged that equations were excluded from patentable subject matter, but found that the system claims in issue would not preempt all uses of the recited equations:

> [A] member of the public would have to do much more than use the equations to infringe any of these claims. He would have to use them in the physical equipment recited in the claim.… We should not penalize the inventor who makes his invention by discovering new and unobvious mathematical relationships which he then utilizes in a machine, as against the inventor who makes the same machine by trial and error and does not disclose the laws by which it operates.[20]

The comparison between the two inventors here appeals to the longstanding principle that a patent applicant has no duty to disclose a correct theory of operation.[21] In making the comparison, the court's implication was that Bernhart and Fetter had not only invented a new machine, but had performed the further public service of disclosing its theory of operation, over and above the amount of disclosure needed to patent it. In this account, the mathematical equations played no part in the invention's patent-eligibility, which turned solely on the invention's characterization as a new machine.

The court then made the characterization explicit by way of invoking the "new machine" principle for the first time as a rationale for patent-eligibility:

> [I]f a machine is programmed in a certain new and unobvious way, it is physically different from the machine without that program; its memory elements are differently arranged. The fact that these physical changes are invisible to the eye should not tempt us to conclude that the machine has not been changed. If a new machine has not been invented, certainly a "new and useful improvement" of the unprogrammed machine has been.… We are concluding here that such machines are statutory under 35 U.S.C. § 101, and that claims defining them must be judged for

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[19] In re Bernhart, 417 F.2d at 1398.

[20] Id. at 1399-1400 (emphasis omitted).

[21] *See* Newman v. Quigg, 77 F.2d 1575, 1581-82 (Fed. Cir. 1989).

patentability in light of the prior art.[22]

Having placed Bernhart and Fetter's claims in the statutory category of "new and useful … machine[s]," the court proceeded to conduct a deeply problematic review of the Patent Office's § 103 rejection of the Bernhart and Fetter's claims in light of the prior art. Unbeknownst to the Boeing scientists, a very similar patent application, filed in 1960 by Bernard Taylor, Jr., was already pending in the Patent Office.[23] Taylor had claimed a system with special-purpose circuitry for calculating and outputting the coordinates of a planar projection of a three-dimensional object. Taylor's circuits calculated the coordinates (f_1, f_2) representing the projections of an object point $C = (c_1, c_2, c_3)$ from a viewpoint $A = (a_1, a_2, a_3)$ onto the plane passing through the point $B = (b_1, b_2, b_3)$ and normal to the line between this point and the viewpoint. Taylor's application disclosed the following expressions for f_1 and f_2:

$$f_1 = d_1 \Psi / \lambda$$

$$d_1 = \sqrt{e_1^2 + e_2^2 + e_3^2}$$

$$(e_1, e_2, e_3) = \big((a_1 - b_1), (a_2 - b_2), (a_3 - b_3)\big)$$

$$\Psi = \frac{e_3 \omega}{d_2} - d_2 \gamma_3$$

$$\omega = e_1 \gamma_2 + e_2 \gamma_1$$

$$(\gamma_1, \gamma_2, \gamma_3) = \big((a_1 - c_1), (a_2 - c_2), (a_3 - c_3)\big)$$

$$d_2 = \sqrt{e_1^2 + e_2^2}$$

$$\lambda = \omega + e_3 \gamma_3$$

$$f_2 = \frac{\left[(a_1 - b_1)^2 + (a_2 - b_2)^2 + (a_3 - b_3)^2\right]\left[(a_1 - b_1)(a_1 - c_2) - (a_2 - b_2)(a_1 - c_1)\right]}{\sqrt{(a_1 - b_1)^2 + (a_2 - b_2)^2}\left[(a_1 - b_1)(a_1 - c_1) + (a_2 - b_2)(a_2 - c_2) + (a_3 - b_3)(a_3 - c_3)\right]}$$

When rewritten solely in terms of A and C (with B set to the origin), these expressions simplify to the following representations of Bernhart and Fetter's equations:

[22] In re Bernhart, 417 F.2d at 1400.
[23] U.S. Patent 3,153,224 (filed Feb. 23, 1960).

$$f_2 = \frac{(a_1^2 + a_2^2 + a_3^2)(a_2 c_1 - a_1 c_2)}{\sqrt{(a_1^2 + a_2^2)}\left[(a_1^2 + a_2^2 + a_3^2) - (a_1 c_1 + a_2 c_2 + a_3 c_3)\right]}$$

$$f_1 = \frac{\sqrt{a_1^2 + a_2^2 + a_3^2}}{\sqrt{a_1^2 + a_2^2}}\left(\frac{-a_1 a_3 c_1 - a_2 a_3 c_2 + c_3(a_1^2 + a_2^2)}{(a_1^2 + a_2^2 + a_3^2) - (a_1 c_1 + a_2 c_2 + a_3 c_3)}\right)$$

In fact, an enterprising patent examiner performed these algebraic simplifications over six pages of manuscript, showing that for $(a_1, a_2, a_3) = (kx_e, ky_e, kz_e)$ and $(c_1, c_2, c_3) = (x_i, y_i, z_i)$, Taylor's formulas calculate the same projection coordinates $(f_2, f_1) = (v_i, w_i)$.[24] Accordingly, the Patent Office rejected Bernhart and Fetter's claims as obvious over Taylor's application[25] in light of known programmed computer systems with plotters.[26]

The court was not persuaded by the examiner's algebra, finding that it amounted to a hindsight reconstruction of Bernhart and Fetter's equations:

> There is nothing in the record to suggest that there was any possibility of the simplified programming claimed by the applicants in claim 19. The Patent Office belatedly … attempts to show that Taylor's equations can be manipulated to an identity with the [applicants'] equations.… In so doing the solicitor has had the benefit of seeing applicants' equations, and with this hindsight a mathematical identity is revealed. There is nothing to suggest that, within the context of automated drawing, *one of ordinary mathematical skill* armed with the Taylor reference would be able to discover the simpler equations which are the basis of the claimed programming.[27]

Hindsight is a legitimate concern for courts and patent examiners when inquiring into whether a claimed invention was nonobvious at the time it was made.[28] In formulating an obviousness rejection, there can be a "temptation to read into the prior art the teachings of the invention in issue,"[29] thereby understating the difficulty of the problem that would have faced a person having ordinary skill in the art at the time of invention. The *Bernhart* court's characterization of the examiner's calculations, however,

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[24] Brief for the Commissioner of Patents at 13-18, In re Bernhart, 417 F.2d 1395 (C.C.P.A. 1969) (filed June 21, 1968).

[25] *See id.* at 6.

[26] *See, e.g.*, U.S. Patent 3,066,868.

[27] 417 F.2d at 1402.

[28] KSR Intern. Co. v. Teleflex Inc., 550 U.S. 398, 421 (2007).

[29] See Graham v. John Deere, 383 U.S. 1, 36 (1966).

is strained at best.

The reason Bernhart and Fetter's equations are simpler than Taylor's is that the former apply only to the special case where the normal from the viewpoint to the projection plane passes through the origin. Once the coordinates b_1, b_2, b_3 drop out of Taylor's equations, the expressions are greatly simplified, and it is a straightforward exercise in first-year algebra to solve for f_1 and f_2 in terms of A and C. From these simplified equations, expressing $\{(v_i, w_i)\}$ in terms of $\{(x_i, y_i, z_i)\}, (x_e, y_e, z_e)$ and k requires only a change of notation. Bernhart and Fetter's equations immediately follow from Taylor's prior art disclosure as a special case, at least to one of ordinary skill in ninth-grade mathematics.[30] In short, the court's determination as to what a person of "ordinary mathematical skill" would be able to do with a particular set of algebraic equations is problematic, because it grossly underestimates the mathematical abilities of the patent's intended audience.

Even more fundamentally, the court's notion of an inventor "discovering new and unobvious mathematical relationships" and its interposition of "mathematical skill" for the predicate of "ordinary skill in the art" constitute category mistakes, because the attributes of nonobviousness and ordinary skill in the art are inapplicable to the mathematical derivation of equations (and the category of the mathematical arts more generally). As the Supreme Court's *Flook* decision acknowledges, even previously unknown mathematical properties must be "assumed to be within the prior art" at the outset of a patentability determination.[31] Moreover, a § 103 inquiry into the level of ordinary skill in the art[32] is misplaced where the art in question, and the field of knowledge being advanced by the patent disclosure, is not one of the "useful Arts," but mathematics.[33]

The *Bernhart* court's invocation of the "new machine" principle thus proved counterproductive, in that the patentability analysis of a claimed software-implemented invention should never leave a court in the position

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[30] The nonobviousness analysis is not changed by characterizing Bernhart and Fetter's as a species selected from a prior art genus. *See* MPEP 2144.08. On the other hand, Taylor's equations are not readily deducible from Bernhart and Fetter's disclosure, which offers no indication as to how to calculate the coordinates of a projection onto a plane located elsewhere in space.

[31] 437 U.S. at 594.

[32] *Graham v. John Deere Co.*, 383 U.S. 1, 17 (1966).

[33] *See id.* at 6 (quoting U.S. CONST., art. I, § 8, cl. 8) ("Innovation, advancement, and things which add to the sum of useful knowledge are inherent requisites in a patent system which by constitutional command must 'promote the Progress of … useful Arts.'").

of determining how hard the math was. Nevertheless, the Court of Customs and Patent Appeals and the Federal Circuit continued to apply the principle to "a general purpose computer programmed to carry out the claimed invention"[34] in cases spanning the next three decades. As the Federal Circuit majority summarized this caselaw in *In re Alappat*: "We have held that such programming creates a new machine, because a general purpose computer in effect becomes a special purpose computer once it is programmed to perform particular functions pursuant to instructions from program software."[35]

In its 1994 en banc decision in *Alappat*, the Federal Circuit reviewed the Patent Office's rejection of five claims, four of which were dependent from the first.[36] The representative claim read:

> 15. A rasterizer for converting vectors in a data list representing sample magnitudes of an input waveform into anti-aliased pixel illumination intensity data to be displayed on a display means comprising:
>
> (a) means for determining a vertical distance between the endpoints of each of the vectors in the data list;
>
> (b) means for determining an elevation of a row of pixels that is spanned by the vector;
>
> (c) means for normalizing the vertical distance and elevation; and
>
> (d) means for outputting illumination intensity data as a predetermined function of the normalized vertical distance and elevation.[37]

Construing this claim in accordance with § 112(f), the court replaced each of the four "means" terms in clauses (a)-(d) with what it determined to be the corresponding structure disclosed in the specification:

> 15. A rasterizer [a "machine"] for converting vectors in a data list representing sample magnitudes of an input waveform into anti-aliased pixel illumination intensity data to be displayed on a display means comprising:
>
> (a) [an arithmetic logic *circuit* configured to perform an absolute value function, or an equivalent thereof] for determining a vertical distance between the endpoints of each of the vectors in the data list;

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[34] In re Alappat, 33 F.3d 1526, 1545 (Fed. Cir. 1994).
[35] *Id.*
[36] Alappat, 33 F.3d at 1538-39.
[37] Id.

> (b) [an arithmetic logic *circuit* configured to perform an absolute value function, or an equivalent thereof] for determining an elevation of a row of pixels that is spanned by the vector;
>
> (c) [a pair of *barrel shifters*, or equivalents thereof] for normalizing the vertical distance and elevation; and
>
> (d) [a *read only memory (ROM)* containing illumination intensity data, or an equivalent thereof] for outputting illumination intensity data as a predetermined function of the normalized vertical distance and elevation.[38]

A close examination of Alappat's patent specification also illuminates what (I have suggested elsewhere[39]) is the *sine qua non* of a structural element: its involvement in a causal process. As Table 1 illustrates, *Alappat* discloses several explicitly causal processes that together produce the functions of the claimed machine, including processes respectively involving the disclosed arithmetic logic circuit (the "ALU"), barrel shifters, and the read-only memory.

Disclosed Element	**Disclosed Causal Process**
arithmetic logic circuit	"[V]arious operations of rasterizer 40 … are timed by clock signals produced by a state machine in accordance with control data… One signal is a 'pixel clock' signal that is asserted to *cause* the rasterizer to receive each new vector list data element… This [ALU] value is stored in a register 76 on the next pixel clock cycle."[40]
barrel shifter	"[P]riority encoder 86 *causes* barrel shifter 84 to shift its input to the left by the number of bits required…"[41]
Read-only memory	"The 8-bit intensity data stored in register 90 addresses a read only memory (ROM) 92 and *causes* ROM 92 to read out a 4-bit intensity data value which is stored in a register 94 on the next pixel clock cycle."[42]

Table 1. Causal processes involving each of the disclosed structural elements

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[38] Id. at 1541.

[39] *See* Andrew Chin, *The Ontological Function of the Patent Document*, 74 U. PITT. L. REV. ___ (2013) (discussing Centricut, LLC v. Esab Group, Inc., 390 F.3d 1361 (2004)).

[40] U.S. Patent 5,440,676, cols. 3-4 (emphasis added).

[41] Id. at col. 6 (emphasis added).

[42] Id. at cols. 6-7 (emphasis added).

supporting claim 15.

Having construed claim 15 narrowly in accordance with these structural limitations, the court reasoned that the claim "unquestionably recites a machine, or apparatus, made up of a combination of known electronic circuitry elements."[43]

Observing that a "machine" is explicitly recognized as patent-eligible subject matter under § 101, the court proceeded to use the conclusion from its § 112(f) analysis — that claim 15 recites a machine — as the starting point for its § 101 analysis:[44]

> [T]he claimed invenion as a whole is directed to a combination of interrelated elements which combine to form a machine for converting discrete waveform data samples into anti-aliased pixel illumination intensity data to be displayed on a display means. This is not a disembodied mathematical concept which may be characterized as an "abstract idea," but rather a specific machine to produce a useful, concrete, and tangible result.

The Federal Circuit's subsequent gloss on *Alappat*'s § 112(f) analysis as grounded in a finding that "[t]he instructions of the software program that carry out the algorithm electrically change the general purpose computer by creating electrical paths within the device,"[45] was simply revisionism. The *Alappat* majority made no mention of "electrical paths" being created through programming. Its § 112(f) analysis was instead appropriately grounded in the structural nature of the disclosed elements that it determined to correspond to each of the claimed "means" terms: arithmetic logic circuits, a barrel shifter, and a read only memory.[46] In short, the *Alappat* majority's § 112(f) analysis informed its § 101 analysis, not the other way around.

Alappat's "new machine" principle soon became a mainstay of the Patent Office's 1996 Guidelines for Examining Computer-Related Inventions,[47] but it has not fared well in the present century. Long before

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[43] Id.

[44] Id. at 1541-42.

[45] *See* WMS Gaming, Inc. v. Int'l Game Tech., 184 F.3d 1339, 1348 (Fed. Cir. 1999) (citing Alappat, 33 F.3d at 1545).

[46] *See* Alappat, 33 F.3d at 1541.

[47] *See* United States Patent and Trademark Office, *Examination Guidelines for Computer-Related Inventions*, 61 Fed. Reg. 7478 (Feb. 28, 1996) (citing *Alappat* nine times).

The *Alappat* court also reasoned that the claimed programmed general-purpose computer was "not a disembodied mathematical concept which may be characterized as

Alice,[48] the "new machine" principle had been criticized often enough to earn the derisory nickname "The Old Piano Roll Blues."[49] The implied comparison, as the government had argued in *Gottschalk v. Benson*,[50] was to "the insertion of a new piano roll into an old player piano," which may enable the piano to play a new song, but should not be considered "a patentable 'discovery.'"[51] Former Chief Judge Glenn Archer's *Alappat* dissent appealed to the analogy at length, concluding that "[t]he only invention by the creator of a roll that is new because of its music is the new music,"[52] which is nonstatutory subject matter.

By 2008, a majority of the Federal Circuit sitting en banc in *In re Bilski*[53] had begun to call into question the characterization of a programmed generic computer as a new machine. In 1997, Bernard Bilski and Rand Warsaw (Bilski) had applied for a patent on a method for making a market for the sale of a commodity, such as natural gas, in which buyers and sellers desired to manage risks relating to fluctuations in the quantity consumed.[54] Prior art energy trading methods focused on

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an 'abstract idea,' but rather a specific machine to produce a useful, concrete, and tangible result," *id.* at 1544, but it was not until *State Street Bank* that the Federal Circuit elevated *Alappat*'s "useful, concrete, and tangible result" language into a test for patent-eligibility. State Street Bank & Trust Co. v. Signature Financial Group, Inc., 149 F.3d 1368, 1373 (Fed. Cir. 1998) ("Today, we hold that the transformation of data, representing discrete dollar amounts, by a machine through a series of mathematical calculations into a final share price, constitutes a [patent-eligible invention] because it produces 'a useful, concrete and tangible result'…."). The Federal Circuit abrogated this test in *Bilski*, 545 F.3d at 959-60.

[48] Alice Corp. v. CLS Bank Int'l, 573 U.S. ___ (2014).

[49] *Old Piano Roll Blues*, in PETER GROVES, A DICTIONARY OF INTELLECTUAL PROPERTY LAW 220 (2011).

[50] 409 U.S. 63 (1972).

[51] Government's Opening Brief, Gottschalk v. Benson, 409 U.S. 63 (1972).

[52] In re Alappat, 33 F.3d at 1567 (Archer, J., dissenting).

[53] In re Bilski, 545 F.3d 943 (Fed. Cir. 2008) (en banc).

[54] *See* U.S. Patent Application Serial No. 08,833,892 (filed Apr. 10, 1997). Claim 1 read:

> A method for managing the consumption risk costs of a commodity sold by a commodity provider at a fixed price comprising the steps of: (a) initiating a series of transactions between said commodity provider and consumers of said commodity wherein said consumers purchase said commodity at a fixed rate based upon historical averages, said fixed rate corresponding to a risk position of said consumer; (b) identifying market participants for said commodity having a counter-risk position to said consumers; and (c) initiating a series of transactions between said commodity provider and said market participants at a second fixed rate such that said series of market participant transactions balances the risk position of said series of consumer transactions.

managing risks relating to price volatility.[55] Despite the apparent commercial value of Bilski's method,[56] Bilski's patent claims met with stiff opposition. Of the twenty-six Supreme Court, Federal Circuit and administrative patent judges who considered Bilski's application, all but one found the claims to be directed to nonstatutory subject matter under 35 U.S.C. § 101.[57] The judges divided more sharply, however, in their reasoning. Majorities of the Federal Circuit and the Board of Patent Appeals and Interferences held that a patentable process must either be tied to a particular machine or transform an article,[58] and found Bilski's claims to fail both prongs of this "machine-or-transformation" test.[59] Four Supreme Court justices (including Justice Stevens) and three Federal Circuit judges opined that methods of doing business should be held nonstatutory[60]—at least those that do not involve manufactures, machines or compositions of matter.[61] A five-justice Supreme Court majority, however, held that neither a mandatory "machine-or-transformation" test nor the so-called "business method" exclusion was warranted by precedent[62] or necessary to invalidate Bilski's claims as directed to an

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Id.

[55] *See id.*

[56] *See Validity of Software Patents Goes on Trial Today at Supreme Court*, USA TODAY, Nov. 9, 2009, at 7B (reporting that Bilski's company, Weatherwise USA, offers energy-billing services that can "lock in energy prices, even during an unusually cold winter").

[57] *See In re Bilski*, 545 F.3d at 997 (Newman, J., dissenting) (finding Bilski's claimed process to be "neither a fundamental truth nor an abstraction").

[58] *See id.* at 954 (majority opinion) (citations omitted) ("A claimed process is surely patent-eligible under § 101 if: (1) it is tied to a particular machine or apparatus; or (2) it transforms a particular article into a different state or thing."); *Ex parte* Bilski, 2006 WL 5738364, at *18 (holding that a claim that does not recite a specific apparatus may be directed to patentable subject matter "if there is a transformation of physical subject matter from one state into another . . ."); *see also id.* at *14 ("It is possible that a non-machine-implemented method may be nonstatutory subject matter if it does not perform a transformation of physical subject matter even though it contains physical steps that might prevent i[t] from being labeled an 'abstract idea.'").

[59] *See In re Bilski*, 545 F.3d at 962 (finding "the machine implementation part of the test" inapplicable to Bilski's claims); *id.* at 963 (holding that Bilski's claims do not transform any article to a different state or thing); *Ex parte Bilski*, 2006 WL 5738364, at *2 (noting that Bilski's claims are "non-machine-implemented"); *id.* at *18–20 (holding that none of Bilski's claims involve a physical transformation).

[60] *See* Bilski v. Kappos, 130 S. Ct. 3218, 3231 (2010) (Stevens, J., concurring); *In re Bilski*, 545 F.3d at 998 (Mayer, J., dissenting).

[61] *See In re Bilski*, 545 F.3d at 974 (Dyk, J., concurring).

[62] *Bilski*, 130 S. Ct. at 3227 ("The 'machine-or-transformation' test is not the sole test for deciding whether an invention is a patent-eligible 'process.'"); *id.* at 3228 ("Section 101 similarly precludes the broad contention that the term 'process' categorically excludes

unpatentable abstract idea.[63]

Alice Corp. v. CLS Bank Int'l[64] followed soon thereafter, and with it, the Federal Circuit's recognition that the Supreme Court had called into question the *Alappat* court's appeal to the "new machine" principle.[65] The Supreme Court's holding that "mere recitation of a general computer cannot transform a patent-ineligible abstract idea into a patent-eligible invention"[66] also appears to call the *Bernhart* court's reasoning into question. The Patent Office's 2019 Revised Patent Subject Matter Eligibility Guidance[67] accordingly made no mention of the "new machine" principle, focusing instead on the preemption concerns the Supreme Court highlighted in *Mayo*[68] and *Alice*.[69]

The § 101 reform bill drafted by Sen. Thom Tillis and Rep. Chris Coons effectively calls for a return to the problematic characterization of a programmed general-purpose computer as a "new machine." The proposed legislation also appeals to the utility-focused patent-eligibility determination in the Federal Circuit's 1998 *State Street Bank v. Signature Financial Group* decision,[70] which relies on a revisionist gloss on *Alappat*.[71] Given its tenuous origins in Federal Circuit caselaw, the "new machine" principle is a dubious candidate for codification. As the next section shows, the Supreme Court's software patent jurisprudence has not focused on whether a claimed programmed computer constitutes a "new machine," but on whether the claim effectively preempts an abstract idea.

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business methods.").

[63] *Id.* at 3231 ("Allowing petitioners to patent risk hedging would preempt use of this approach in all fields, and would effectively grant a monopoly over an abstract idea.").

[64] Alice Corp. v. CLS Bank Int'l, 134 S.Ct. 2347 (2014).

[65] *See* CLS Bank Int'l v. Alice Corp., 717 F.3d 1269, 1292 (Fed. Cir. 2013) (en banc) (plurality opinion) (Lourie, J.) ("Not only has the world of technology changed, but the legal world has changed. The Supreme Court has spoken since *Alappat* on the question of patent eligibility, and we must take note of that change.").

[66] 134 S.Ct. at 2358.

[67] *See* U.S. Patent & Trademark Office, *2019 Revised Patent Subject Matter Eligibility Guidance*, 84 Fed. Reg. 50 (Jan. 7, 2019).

[68] 566 U.S. 66 (2012).

[69] 573 U.S. 208 (2014).

[70] 149 F.3d 1368 (Fed. Cir. 1998). In *State Street Bank*, accused infringers challenged a claim for a computer-implemented accounting system for a "hub-and-spoke" financial product as directed to non-statutory subject matter. *See id.* at 1371.

[71] *See supra* text accompanying notes 45-46. For purposes of characterizing the system as a statutory "machine" under § 101, the court found it sufficient that the claimed "machine programmed with the Hub and Spoke software … admittedly produces a 'useful, concrete, and tangible result.'" *See id.* at 1375 (citing Alappat, 33 F.3d at 1544).

II. PREEMPTION CONCERNS

Both historically and recently, the Supreme Court has grounded its doctrine regarding the subject matter eligibility of software-related patent claims in the stated concern that those not sufficiently confined to a practical application could have the effect of preempting abstract ideas.[72] To this day, however, the courts have not developed a coherent jurisprudential framework that can explain and justify their patent-eligibility decisions in terms of these stated preemption concerns.[73] Preemption considerations do not adequately explain the lines of reasoning the Court has actually undertaken in adjudicating the subject matter eligibility of software-related patent claims. Nor do they furnish a normative justification for the use of patent-eligible subject matter doctrine, as opposed to other patentability doctrines, to exclude claimed subject matter.

Patent-eligibility jurisprudence regarding software-related inventions originated in 1972 with *Gottschalk v. Benson*,[74] where the Court offered a preemption rationale for upholding the Patent Office's rejection of claims directed to a "method of converting signals from binary coded decimal form into binary" comprising a sequence of steps to be performed on a "reentrant shift register."[75] Characterizing Benson's patent claims as directed to "the formula for converting BCD numerals to pure binary numerals,"[76] the Court reasoned that the formula "has no substantial practical application except in connection with a digital computer, which means that … the patent would wholly pre-empt the mathematical formula and in practical effect would be a patent on the algorithm itself."[77] Accordingly, allowing Benson's claims would have the "practical effect" of allowing Benson to "patent an idea."[78]

BCD to binary conversion is necessarily performed by any application that combines a digital numeric user interface with a binary arithmetic

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[72] *See* Gottschalk v. Benson, 409 U.S. 63, 71 (1972).

[73] *See* Katherine J. Strandburg, *Much Ado About Preemption*, 50 HOUSTON L. REV. 563, 564-68 (2012) (arguing that a focus on preemption "is unsatisfactory, both as a theoretical matter and as an explanation of the Supreme Court's patentable subject matter jurisprudence").

[74] *Id.*

[75] *Id.* at 73-74.

[76] *Id.* at 71.

[77] *Id.* at 71-72.

[78] *Id.* at 71.

circuit calculation. The Court described the conversion as exceptionally versatile, with applications ranging "from the operation of a train to verification of drivers' licenses to researching the law books for precedents" as well as other "unknown uses."[79] Benson's claims, however, did not cover the only algorithm for converting numbers from a BCD representation to a binary representation. For example, the conventional approach to performing the conversion is to calculate the binary representation of each digit in its respective base-10 place value and to sum the results by binary addition. Benson's method more specifically sequenced the necessary multiplications and additions so as to perform the calculation efficiently on a "reentrant shift register," a type of computer architecture whose basic steps include the ability to shift all of a string of bits one locations to the left or right, with the first and last locations wrapped around (i.e., treated as adjacent). In other words, Benson's claims were directed to just one of many possible correct algorithms for performing BCD to binary conversion, albeit one particularly well-suited for implementation on a reentrant shift register.

The Court's analysis of Benson's claims ultimately amounted to little more than a gesture toward its stated preemption concerns. While the Court indicated that the claims were problematically overbroad in discussing the BCD to binary conversion's versatility, the Court did not compare the claims' actual scope with the full range of algorithms and architectures that could have been applied to the allegedly pre-empted end uses. In short, preemption considerations neither explain nor justify the *Benson* decision.

As the form and substance of software-related patent claims has evolved over the nearly half-century since *Benson*, the Supreme Court's patent-eligibility jurisprudence has come no closer to elucidating the application and purpose of preemption. In 2010, the *Bilski* Court majority rejected the Federal Circuit's "machine-or-transformation" test,[80] finding it sufficient to observe that the representative claims "explain the basic concept of hedging,"[81] which is "a fundamental economic practice long prevalent in our system of commerce and taught in any introductory finance class."[82] Echoing *Benson*, the majority concluded that the claims

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[79] *Id.* at 68.

[80] *See supra* text accompanying notes 53-63

[81] 130 S.Ct. at 3231.

[82] *Id.* (quoting In re Bilski, 545 F.3d at 1013 (Rader, J., dissenting)); Rochelle C. Dreyfuss & James P. Evans, *From* Bilski *Back to* Benson*: Preemption, Inventing Around, and the Case of Genetic Diagnostics*, 63 STAN. L. REV. 1349 (2011).

therefore "would pre-empt use of this approach in all fields, and would effectively grant a monopoly over an abstract idea."[83] Dependent claims limited to "commodities and energy markets" were equally problematic as a mere "attempt to patent the use of the abstract idea of hedging risk in the energy market and then instruct the use of well-known random analysis techniques."[84] Thus the majority's findings of preemption were based not on the scope of any claim terms, but on the fact that the claims "explain" an idea taught in business school. Given the majority's rejection of the efforts of four concurring justices to establish a business-method exclusion from patent-eligibility,[85] it is difficult to distill a clear method or rationale from the *Bilski* Court's preemption analysis.

The Court's subsequent decisions in *Mayo* and *Alice* even more explicitly described patent-eligible subject matter jurisprudence as animated by preemption concerns. The *Mayo* Court warned that upholding the claims at bar "would risk disproportionately tying up the use" of "the basic tools of scientific and technological work"[86] and would "tend to impede innovation more than it would tend to promote it."[87]

The *Alice* Court similarly referred to "the pre-emption concern that undergirds our § 101 jurisprudence" in extending *Mayo*'s analysis to the representative claim, finding that a "wholly generic computer implementation is not generally the sort of 'additional featur[e]' that provides any 'practical assurance that the process is more than a drafting effort designed to monopolize the [abstract idea] itself.'"[88] As in *Bilski*, however, the *Alice* Court did not conduct a careful analysis of claim scope and downstream impact, but instead relied on the observation that the claims were "drawn to the concept of intermediated settlement," which like hedging is "'a fundamental economic practice long prevalent in our system of commerce.'"[89] Preemption thus fails to explain or justify the *Alice* Court's § 101 analysis satisfactorily, as other commentators have noted.[90]

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[83] *Id.*

[84] *Id.*

[85] *See id.* at 3228-29.

[86] Mayo Collaborative Servs. v. Prometheus Labs., Inc., 132 S. Ct. 1289, 1293-94 (2012).

[87] 132 S. Ct. at 1293.

[88] Alice Corp. v. CLS Bank, 134 S.Ct. 2347, 2358 (2014).

[89] Id. at 2356 (quoting Bilski, 130 S.Ct. at 3218).

[90] *See, e.g.*, Arpita Bhattacharyya, *Unpatentably Preemptive? A Case Against the Use of Preemption as a Guidepost for Determining Patent Eligibility*, NE. U. L.J. EXTRA LEGAL (Summer 2013); Strandburg, *supra* note 73.

The divergence between the Supreme Court's stated preemption concerns and its actual subject matter eligibility analysis of software patent claims has occasioned a protracted effort by the Patent Office to guide examiners through the perceived "current muddle in patentable subject matter analysis."[91] Guidance materials published in 2014[92] and 2019[93] provide examiners with an algorithmic approach to the analysis based on the Supreme Court's analyses in *Mayo* and *Alice*, and subsequent Federal Circuit caselaw. The centerpiece of the approach is the flowchart of Figure 1, which was introduced in the Patent Office's 2014 guidance and further revised in 2019. Following a series of recent Federal Circuit concurrences and dissents criticizing, *inter alia*, the mismatch between post-*Alice* abstract-idea jurisprudence and the Court's preemption concerns,[94] the revised guidance instructs examiners to construe the exception narrowly in two respects. First, the range of subject matter that can be considered an abstract idea is confined to an enumerated list of "groupings" identified in judicial precedent, such as mathematical concepts, certain methods of organizing human activity (such as fundmanetal economic principles, commercial and legal interactions, and managing personal behavior), and mental processes.[95] Second, a claim is not found to be directed to an abstract idea if the recited idea is found to be "integrated into a practical application."[96]

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[91] Strandburg, *supra* note 73. at 564.

[92] U.S. Patent & Trademark Office, *2014 Interim Guidance on Patent Subject Matter Eligibility*, 79 Fed. Reg. 74,618 (Dec. 16, 2014) ("2014 Guidance").

[93] U.S. Patent & Trademark Office, *2019 Revised Patent Subject Matter Eligibility Guidance*, 84 Fed. Reg. 50 (Jan. 7, 2019) ("2019 Guidance").

[94] *See* Smart Sys. Innovations, LLC v. Chicago Transit Auth., 873 F.3d 1364, 1377 (Fed. Cir. 2017) (Linn, J., dissenting in part and concurring in part) (citations omitted) ("Ultimately, the fundamental question in 'abstract idea' cases is whether the claim is directed to such a basic building block of scientific or technological activity as to foreclose or inhibit future innovation or whether the claim instead is directed to a tangible application that serves a 'new and useful end.' Claims directed not merely to basic building blocks of scientific or technological activity … should be fully eligible for patent protection and not lightly discarded."); 2019 Guidance, 84 Fed. at 50 n.2 (citing *Smart Sys. Innovations* and additional Federal Circuit concurrences and dissents).

[95] 84 Fed. Reg. at 51-52.

[96] Id. at 54-55.

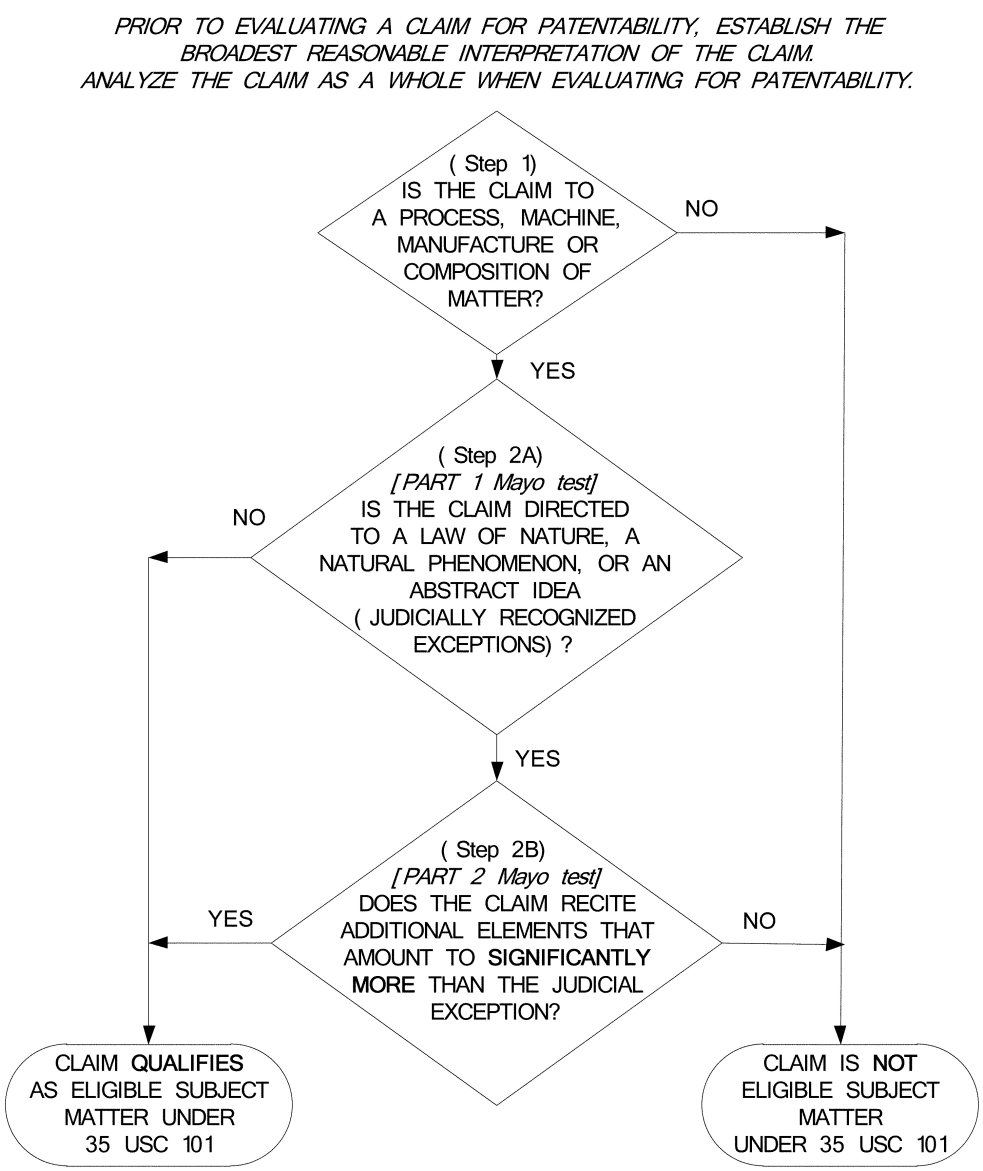

Figure 1. Flowchart representation of Patent Office guidance since 2014 for examination of claims under the § 101 patent-eligible subject matter requirement.[97]

The draft legislation offers a different response to the misalignment between § 101 jurisprudence and preemption concerns, namely, to abrogate the former and shift the scrutiny of claims for overbreadth to the other statutory requirements for patentability. As Joshua Sarnoff has

[97] 2014 Guidance, *supra* note 92, at 74621.

persuasively pointed out, however, this approach "will just displace … [the] unclear policies and uncertain interpretations and applications [of § 101] to other patent law doctrines."[98]

In addition, as we will see in the next section, the notion that § 101's scope-policing functions can be incorporated into patent law's novelty, nonobviousness and sufficiency of disclosure doctrines belies the patent-eligible subject matter requirement's unique and vital role in obviating inapposite inquiries under these statutory requirements. This gatekeeping function provides a more accurate explanation of and compelling justification for software patent-eligibility jurisprudence, both historically and currently, than the Court's stated preemption concerns.

III. GATEKEEPING

Over the past four decades of software patent-eligibility jurisprudence, § 101 has served a vital gatekeeping function, foreclosing the patentability analysis before the consideration of other statutory requirements would necessitate inapposite inquiries. The Supreme Court in *Parker v. Flook*[99] stated this gatekeeping function as the "obligation to determine what type of discovery is sought to be patented," which "must precede the determination of whether that discovery is, in fact, new or obvious."[100] Soon thereafter, in *In re Bergy*,[101] Judge Giles Rich formulated his famous "three doors" account of patentability, in which the § 101 eligibility inquiry is the first door whose threshold requirements precede all other patentability considerations.[102] As Chief Judge Glenn Archer explained this doctrinal precedence in *In re Alappat*,[103] subject matter eligibility "lays the predicate for the other provisions of the patent law"[104] and thereby obviates inapposite inquiries under those provisions:

> If Einstein could have obtained a patent for his discovery that the energy of an object at rest equals its mass times the speed of light squared, how would his discovery be meaningfully judged for nonobviousness, the *sine qua*

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[98] Testimony of Joshua D. Sarnoff, Senate Committee on the Judiciary, Subcommittee on Intellectual Property Hearing: The State of Patent Eligibility in America: Part I (June 4, 2019), at 8.

[99] 437 U.S. 584 (1978).

[100] *See id.* at 593.

[101] 596 F.2d 952 (C.C.P.A. 1979) (Rich, J.).

[102] *See id.* at 960.

[103] In re Alappat, 33 F.3d 1526 (Fed. Cir. 1994) (citing Parker v. Flook, 437 U.S. at 593) (Archer, C.J., concurring in part and dissenting in part).

[104] *Id.* at 1553.

> *non* of patentable invention [under § 103]? When is the abstract idea "reduced to practice" as opposed to being "conceived" [under § 102(g)]? What conduct amounts to the "infringement" of another's idea [under § 271]?[105]

In the only part of the Federal Circuit's splintered *In re Bilski* opinion that the Supreme Court cited with approval, then-Chief Judge Randall Rader advocated a straightforward articulation of the abstract-ideas exception's gatekeeping function over the Federal Circuit majority's "page after page" devoted to developing the machine-or-transformation test. Judge Rader explained that "an abstract claim would appear in a form that is not even susceptible to examination against prior art under the traditional tests for patentability."[106] Thus Judge Rader's conclusion that Bilski's method was "either a vague economic concept or obvious on its face"[107] was not based on an examination for nonobviousness under § 103 against prior art references, but on the more basic observation that "[h]edging is a fundamental economic practice long prevalent in our system of commerce and taught in any introductory finance class."[108]

The Supreme Court majority in *Bilski v. Kappos*[109] cited Judge Rader's criticism of the machine-or-transformation test,[110] quoted his characterization of hedging as "a fundamental economic practice" in support of its abstract-idea analysis,[111] and ultimately adopted his approach. Using the § 101 subject matter requirement to obviate any § 102 and § 103 analysis, the Court declined to subject Bilski's claims "to examination against prior art under the traditional tests for patentability."[112] Instead of reviewing prior art, the Court consulted several then-recent textbooks, none of which predated Bilski's April 16, 1996 priority date,[113] but all of which supported the Court's characterization of "the basic concept of hedging" as an abstract financial idea "taught in any introductory finance class."

Prefiguring the *Alice/Mayo* test, the *Bilski* majority's claim-specific

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[105] *Id.*

[106] In re Bilski, 545 F.3d 943, 1013 (Fed. Cir. 2008) (Rader, C.J., dissenting).

[107] Id.

[108] See id.

[109] 561 U.S. 593 (2010).

[110] See id. at 606 (citing In re Bilski, 545 F.3d at 1015 (Rader, J., dissenting)).

[111] See id. at 611 (quoting In re Bilski, 545 F.3d at 1013 (Rader, J., dissenting)).

[112] 545 F.3d at 1013 (Rader, J., dissenting).

[113] Compare Bilski v. Kappos, 561 U.S. at 611 (citing textbooks published in 2008 and 2010) with U.S. Pat. App. No. 08/833,892 (filed Apr. 10, 1997) (claiming priority to Provisional U.S. Pat. App. No. 60/015,756, filed Apr. 16, 1996).

analysis amounted to a determination that the elements of representative claims 1 and 4 did not add "significantly more"[114] to the judicially excluded abstract "concept of hedging."[115] In claim 1, the concept of hedging is "described"; in claim 4, the concept of hedging is "reduced to a mathematical formula."[116] The Court thus determined that any results or effects produced by the inventions of claims 1 and 4 follow necessarily as logical or mathematical consequences of "the basic concept of hedging," wherein claims 1 and 4 (and their supporting disclosures) serve merely to "explain" these consequences.[117] In this way, both Judge Rader and the Supreme Court majority used § 101's subject matter eligibility requirement as a gatekeeper to obviate an inapposite § 102 or § 103 examination against prior art where the claimed invention's result or effect followed necessarily as a logical consequence of a judicial exception.[118]

In *Alice*, the Court held that "a wholly generic computer implementation" of the judicially excluded abstract idea of "intermediated settlement" was as patent-ineligible as the abstract idea itself.[119] In characterizing the method claims at issue as "simply recit[ing] the concept of intermediated settlement as performed by a generic computer," the Court pointed to Federal Circuit Judge Alan Lourie's observation that the representative claim "lacks *any* express language to define the computer's participation."[120] Alice's claims to computational processes whose efficacy in producing the effect of "intermediated settlement" were not contingent on the empirical causal behavior of a "computer's participation" — i.e., a recited practical "method or means"[121] — but followed necessarily as logical and mathematical consequences of the stipulated behavior of idealized and generic system components ("data processing units" that process data, "mass data storage units" that store data, "communications controllers" that control communications, etc.[122])

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[114] Alice Corp. Pty. Ltd. v. CLS Bank Int'l, 573 U.S. 208, 218 (2014); Mayo Collaborative Svcs. v. Prometheus Labs., Inc. 566 U.S. 66, 77 (2012).

[115] Bilski, 561 U.S. at 611.

[116] Id.

[117] See id.

[118] See id; cf. In re Alappat, 33 F.3d at 1553.

[119] 573 U.S. at 223-24.

[120] Id. at 225 (quoting CLS Bank Int'l v. Alice Corp. Pty. Ltd., 717 F.3d 1269, 1286 (Fed. Cir. 2013) (Lourie, J., concurring))

[121] Diamond v. Diehr, 450 U.S. 175, 182 n.7 (1981) (quoting Corning v. Burden, 56 U.S. 252, 268 (1853)).

[122] The disclosed software solution was designed to run on a "generic 'system'" comprising a collection of "data processing units," "mass data storage units," "communications controllers," "communications hardware products," and "information

and the social interpretation of the data elements being processed by the system within the community of stakeholders involved in the simultaneous exchange of obligations through an intermediary to minimize risk ("credit record," "debit record," "shadow credit record," "shadow debit record," "start-of-day balance," "transaction," "adjustment," "credits" and "debits"[123]) and were therefore amenable to mathematical verification and proof. In finding that the recitation of these elements added "nothing significantly more" to the abstract idea of intermediated settlement,[124] the Court obviated, *inter alia*, inapposite § 103 inquiries into the level of ordinary *mathematical* skill — an inquiry featured in a problematic analysis fifty years ago involving a similarly generic computer system[125] that almost surely does not survive *Alice*.[126]

In *Mayo*,[127] the Court analyzed the subject matter eligibility of a claim for a method of administering a thiopurine drug reciting, *inter alia*, statements that metabolite levels of "less than 230 pmol $8x10^8$ red blood cells" or "greater than 400 pmol per $8x10^8$ red blood cells" indicated a need to adjust the dosage.[128] After characterizing the recited "relationships between concentrations of certain metabolites in the blood and the likelihood that a dosage of a thiopurine drug will prove ineffective or cause harm" as unpatentable laws of nature,[129] the Court turned to the question of "whether the claims do significantly more than simply describe these natural relations."[130] It concluded that the claim's steps amounted to nothing significantly more than "an instruction to doctors to apply the applicable laws when treating their patients" and "to gather data from

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recordal devices," all of which may occur in "many varied configurations, relating not only to the number and types of stakeholders, but also the 'architectures' realisable [sic] by the system hardware and software in combination." U.S. Patent No. 5,970,479 cols. 7-8 (filed May 28, 1993); U.S. Patent No. 6,912,510 cols. 6-8 (filed May 9, 2000); U.S. Patent No. 7,149,720 cols. 7-8 (filed Dec. 31, 2002); U.S. Patent No. 7,725,375 cols. 6-8 (filed June 27, 2005).

[123] See, e.g., U.S. Patent No. 5,970,479 col. 33 (filed May 28, 1993).

[124] Alice, 573 U.S. at 225-26.

[125] See In re Bernhart, 417 F.2d 1395, 1402 (C.C.P.A. 1969) (reasoning in a § 103 analysis that "[t]here is nothing to suggest that, within the context of automated drawing, one of ordinary mathematical skill armed with the Taylor reference would be able to discover the simpler equations which are the basis of the claimed programming.").

[126] See Andrew Chin, *Ghost in the "New Machine": How* Alice *Exposed Software Patenting's Category Mistake*, 16 N.C. J.L. & TECH. 623 (2015).

[127] Mayo Collaborative v. Prometheus Labs., 566 U.S. 66 (2012).

[128] 566 U.S. at 75.

[129] Id. at 77.

[130] Id. at 77.

which they may draw an inference in light of the correlations," and were therefore "not sufficient to transform unpatentable natural correlations into patentable applications of those regularities."[131]

In holding Prometheus's dosing methods patent-ineligible, the Court obviated an inapposite § 112 inquiry into whether Prometheus's patent disclosure was sufficient to suit "teach those skilled in the art how to make and use the full scope of the claimed invention without 'undue experimentation.'"[132] The claim's "instruction to doctors" is a teaching, but it is not the kind of teaching that obviates experimentation. Nor is it the kind of teaching that is amenable to examination for sufficiency of disclosure to those of ordinary skill, if "skill" in deductive logic and mathematics are correctly excluded as inapposite.[133]

The claimed result and effect when a doctor measures the metabolite concentration in a patient's blood and adjusts the drug's dosage necessarily follows from the natural law as the logical consequence of the stipulated effects of the doctor's behavior, and is not a matter for empirical verification or falsification.[134] Like the generically recited system components in *Alice*,[135] the step of "determining" the metabolite level is stipulated to determine the metabolite level, and the step of "administering" the thiopurine drug is stipulated to establish the baseline drug dosage to be increased or decreased according to the natural law.

While patent-eligibility doctrine treats abstract ideas and natural phenomena as forms of *a priori* knowledge, their integration into practical applications is signified by the *a posteriori* nature of their ensuing results and effects. Where, as in *Bilski*, *Alice* and *Mayo*, the result or effect of a claimed invention follows necessarily as an *a priori* consequence of the judicial exception, the gatekeeping function of the § 101 patent-eligible subject matter requirement can and should continue to prevent inapposite analyses under the traditional tests for patentability.

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[131] Id. at 79.

[132] In re Wright, 999 F.2d 1557, 1561 (Fed. Cir. 1993) (quoting In re Vaeck, 847 F.2d 488, 495 (Fed. Cir. 1991)).

[133] *See supra* text accompanying notes 125-126.

[134] The fact that the correlation between metabolite levels in the blood and the safety and effectiveness of thiopurine drug treatments was discovered through clinical experiments does not alter the Court's characterization of the claim's "instruction to doctors" as a teaching of a priori rather than empirical knowledge. See Mayo, 566 U.S. at 71 (quoting Gottchalk v. Benson, 409 U.S. 63, 67 (1972) (explaining that "[p]henomena of nature, though just discovered, … are not patentable, as they are the basic tools of scientific and technological work.").

[135] *See supra* text accompanying note 122.

CONCLUSION

The present legislative moment has brought software-patent eligibility jurisprudence to the crossroads of three distinct doctrinal accounts of the abstract-idea exclusion. The first perspective, derived from a doctrinally problematic characterization of mathematics as a useful art, opened the floodgates to software patents through artfully drafted "new machine" claims. The second perspective, promulgated through the Supreme Court's *Mayo* and *Alice* decisions, has engendered unpredictability and confusion by characterizing preemption concerns as an animating principle but failing to align these concerns with the ensuing analyses of the patent claims at bar.

It thus falls to the third perspective to remind would-be reformers of the indispensable gatekeeping function of the judicial exclusions to patent-eligible subject matter. As the early *Bernhart* case illustrates, the proposed abrogation of centuries of patent-eligible subject matter caselaw would disrupt courts' basic working assumptions that prior art, ordinary skill in the art, and making and using without undue experimentation carry their usual meaning and import for the constitutional purpose of promoting the progress of useful arts. Far from disciplining a wayward judiciary, the likely result would be a return to rulings from the bench as to how hard the math was.