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COMPUTER CLAIM DISARRAY: UNTANGLING THE MEANS-PLUS-FUNCTION DOCTRINE TO ELIMINATE IMPERMISSIBLE FUNCTIONAL CLAIMING IN SOFTWARE PATENTS

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In order for a property system to function successfully, it must clearly establish the rights held by the property owners.[1] In real property, this is the concept of marking the boundaries of a property with a fence. It is efficient because public notice about the extent of ownership rights allows others to avoid trespassing and negotiate permissioned use.[2] In intellectual property, these boundaries are far more difficult to discern, as the patentee must mark his boundaries through the words of a patent's claims.[3] These words can mean different things to different people at different times. As it is in real property, the notice function of patents is intended to promote innovation by providing both the public and the patentee with detailed information about what the patentee owns. This allows others the freedom to operate without fear of infringing vague patents, which lowers investment costs and spurs innovation.[4] To this extent, "[n]otice information is a public good,"[5] and to serve this purpose, the scope of the invention must be clearly delineated by the language of the claims.

Clarity of scope, however, is rarely a priority for inventors, who may benefit from keeping the public in the dark about the true scope of their

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1. *See* JAMES BESSEN & MICHAEL J. MEURER, PATENT FAILURE: HOW JUDGES, BUREAUCRATS, AND LAWYERS PUT INNOVATORS AT RISK 46 (2008).

2. *Id.*

3. *Id.*

4. *See* Peter S. Menell and Michael Meurer, *Notice Failure and Notice Externalities*, J. LEGAL ANALYSIS 9–11 (Jan 3, 2013), *available at* http://jla.oxfordjournals.org/content/early/2013/01/03/jla.las019.full.pdf+html ("In many cases of notice failure, the resource developer knows the property owner, but attempts to avoid infringement rather than bargain for permission. When the scope of the rights is ambiguous, such a strategy can prove costly.").

5. *Id.* at 9.

invention.[6] The reward of ownership rights incentivizes a patentee to maximize the scope of his invention, pushing the boundary line outward in order to encapsulate more subject matter and exclusive rights than would actually correspond to the invention. Troublingly, the patentee may get away with this as the Patent Office often devotes little "effort to clarifying patent boundaries in the examination process" and focuses merely on determining whether a claimed invention is novel or nonobvious over the prior art.[7] Thus, the precise scope of a patentee's invention is often left for federal district court judges to determine ex post during claim construction.[8] Because language is uncertain and open to multiple interpretations, both the patentee and the public remain uncertain about the precise scope of the invention until litigation.[9] This uncertainty harms innovation by imposing external costs on third parties to determine the scope of claims[10] and dampens economic growth.[11] Highlighting this issue, the Supreme Court declared, " 'the limits of a patent must be known' . . . . Otherwise, a 'zone of uncertainty which enterprise and experimentation may enter only at the risk of infringement claims would discourage invention only a little less than unequivocal foreclosure of the field' . . . ."[12]

The scope of a patentee's invention is even more uncertain in the context of means-plus-function claims, as this type of claim allows a patentee to claim a function, provided that they sufficiently describe the corresponding

6. *See id.* (noting that "some resource claimants may prefer to obscure the existence, scope, or ownership of their property rights").

7. J. Jonas Anderson & Peter S. Menell, *From de Novo Review to Informal Deference: An Historical, Empirical, And Normative Analysis of the Standard of Appellate Review for Patent Claim Construction* 5 (UC Berkeley Public Law Research Paper No. 2150360, 2012), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2150360.

8. *See id.*

9. *See* Mark Lemley, *Software Patents and the Return of Functional Claiming*, 2013 WIS. L. REV. (forthcoming 2013) (manuscript at 25), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2117302 ("And because the Federal Circuit reverses as many as 40% of claim constructions, the parties really can't know what a software patent covers until the Federal Circuit has addressed the issue.") (citations omitted).

10. *See* Harry Surden, *Efficient Uncertainty in Patent Interpretation*, 68 WASH. & LEE L. REV. 1737, 1752 (2011) ("This increases the information transaction costs for a firm of estimating and assessing infringement liability risk. It also raises the cost of proactively reducing risk by reorienting production activities, or attempting to 'invent around' a particular claim by creating products that do not infringe.") (citing BESSEN & MEURER, *supra* note 1, at 147).

11. *Id.* at 1755 (citing Tamar Frankel, *The Legal Infrastructure of Markets: The Role of Contract and Property Law*, 73 B.U. L. REV. 389, 395–97 (1993)).

12. Markman v. Westview Instruments, Inc., 517 U.S. 370, 390 (1996) (quoting Gen. Elec. Co. v. Wabash Appliance Corp., 304 U.S. 364, 369 (1938) and United Carbon Co. v. Binney & Smith Co., 317 U.S. 228, 236 (1942)).

structure in the patent's specification.[13] The scope of the ownership rights obtained through means-plus-function claims is defined by the structure disclosed in the specification, along with equivalents,[14] which can be difficult to discern.[15] Furthermore, in order to broaden the scope of their invention, some patentees try to use means-plus-function claiming to obtain ownership rights to an entire function; they hope to obtain rights over every way of performing the claimed function.[16] To this extent, patentees attempt to broaden the scope of the corresponding structure, often to the point that what they are asserting as structure is merely a restatement of the claimed function.[17] Because a definitive identification of the corresponding structure occurs during claim construction,[18] the precise scope of the patentee's invention is unknown until decided by a court—at which point many of these claims may be deemed invalid as overly broad.[19] The Federal Circuit has devised a procedure for the district courts to follow in construing the

13. 35 U.S.C. § 112(f) (2006).

14. *Id.*

15. *See* Peter S. Menell, *Promoting Claim Clarity, Solutions to the Software Patent Problem* 1 (UC Berkeley Public Law Research Paper No. 2171287, 2012), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2171287 ("[T]he PTO issues a great many vague patent software claims, creating tremendous uncertainty for subsequent inventors.").

16. *See* Lemley, *supra* note 9, at 2–3. Lemley states:

> While experienced lawyers today generally avoid writing their patent claims in means-plus-function format, software patentees have increasingly been claiming to own the function of their program itself, not merely the particular way they achieved that goal . . . . [B]ecause of the way the means-plus-function claim rules have been interpreted by the Federal Circuit, those patentees have been able to write those broad functional claims without being subject to the limitations of section 112(f).

Id.

17. *See, e.g.*, Ergo Licensing, LLC v. CareFusion 303, Inc., 673 F.3d 1361, 1365 (Fed. Cir. 2012) ("The specification merely provides functional language . . . ."); Aristocrat Techs. v. Int'l Game Tech., 521 F.3d 1328, 1334 (Fed. Cir. 2008) ("The equation thus does not disclose the structure of the claimed device, but is only another way of describing the claimed function.").

18. *See* Anderson & Menell, *supra* note 7, at 4; *see also* Lemley, *supra* note 9, at 24–25. Lemley explains:

> Accordingly, no one can really know what a software patent covers until the court has construed the language of the patent claims. And because the Federal Circuit reverses as many as 40% of claim constructions, the parties really can't know what a software patent covers until the Federal Circuit has addressed the issue.

Id. (citations omitted).

19. *See* cases cited *supra* note 17.

scope of means-plus-function claims.[20] As this procedure has evolved, the Federal Circuit has attempted to reign in prohibited functional claiming and clarify blurry boundary issues by relying on the definiteness requirement of 35 U.S.C. § 112(b)[21] to invalidate overbroad and under-described means-plus-function claims.[22]

In software patents, and other inventions that are implemented by a programmed computer, the issues involving functional claiming are exacerbated and have resulted in a number of substantial problems.[23] In his recent article, Mark Lemley asserted that the "most important problem a product-making software company faces today is . . . suits over claims that purport to cover any possible way of achieving a goal."[24] He claimed that this problem is unique to software and is responsible for the current issues that the industry is facing.[25] He further argued that "the law should rein in efforts to claim to own a goal itself rather than a particular means of achieving that goal" and that "ending functional claiming may be the only way out of the software patent morass in which we now find ourselves."[26]

Lemley identified methods by which software patentees attempt to avoid using the means-plus-function format and instead use impermissible functional claiming. He gave the example of a claim that stated "a computer programmed to calculate an alarm limit."[27] He explained that in this situation,

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20. *See infra* Part II.

21. The America Invents Act changed the nomenclature of 35 U.S.C. § 112. Previously, courts referred to the different paragraphs within this section as ¶ 1, ¶ 2, etc. The new law titles them as (a)–(f). This Note will use the new nomenclature, and for consistency, will do so even when referring to pre-AIA cases that cite the old "¶" nomenclature.

22. The definiteness requirement of § 112 (b) requires that "[t]he specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention." 35 U.S.C. § 112(b).

23. *See* Lemley, *supra* note 9, at 23.

24. *Id.* at 3.

25. *See id.*; *see also id.* at 38. Lemley speculates:

> It is broad functional claiming that leads to assertions that every part of a complex technology product is patented, often by many different people at the same time. It is broad functional claiming that puts stars in the eyes of patent plaintiffs, who can demand huge royalties on the theory that there simply is no other way to implement the technology they have patented. And it is broad functional claiming that makes most of the resulting patents invalid, since even if ten programmers developed ten different algorithms to solve a problem only one of them could be the first to solve the problem at all.

Id.

26. *Id.* at 4.

27. *Id.* at 16.

courts often consider "computer" to be sufficient structural support within the claim and interpret the claims to cover any computer that calculates an alarm limit, no matter how it is programmed to do so.[28] As discussed in Part II, this is not the way that the court would treat this claim if it had been written in the proper means-plus-function format, which would require the court to turn to the specification to find the corresponding structure.[29] Lemley argued that the court should treat this type of claim as a means-plus-function claim and limit the scope of the claim to algorithms disclosed in the specification, as required by existing law.[30] He explained that although "on occasion the Federal Circuit has been more lenient to patentees,"[31] application of existing law could still alleviate the problems associated with overly broad functional claiming, as most of the decisions have not been so tolerant—the Federal Circuit typically limits the claims to the actual implementation of the idea.[32] This Note focuses on this element of Lemley's solution and explains how existing law can be applied to reduce functional claiming and invalidate overly broad software patents. It describes how the Federal Circuit has recently limited the scope of means-plus-function claims by taking the problem of functional claiming seriously, requiring disclosure of sufficient corresponding structure in order to avoid finding a claim indefinite. The heightened scrutiny of means-plus-function claims, combined with Lemley's suggestion of analyzing all functional claims under § 112(f), is a potential solution to the problems caused by overly broad software patents.[33] By highlighting the specifics of this doctrine and honing in on its inconsistencies, this Note also identifies ways in which the law can be clarified to provide clearer notice to patentees and the public about the scope of ownership rights in software patents.

Part I of this Note explains the history of functional claiming and how the Federal Circuit's view on this matter has evolved over time. Part II explains the procedure that the Federal Circuit has used to construe means-plus-function claims. It highlights the specific requirements that the court has developed regarding computer-implemented functions, and explains how a court should determine if the specification contains any corresponding

28. *Id.*

29. *See infra* Part II.

30. *See* Lemley, *supra* note 9, at 38–43.

31. *Id.* at 44 (citing Typhoon Touch Techs., Inc. V. Dell, Inc., 659 F.3d 1376 (Fed. Cir. 2011); *In re* Katz Interactive Call Processing Patent Litig., 639 F.3d 1303 (Fed. Cir. 2011)).

32. Lemley, *supra* note 9, at 45.

33. Other recent proposals also further this goal. *See* Menell, *supra* note 15 at 1–2 (suggesting that identification of means-plus-function claims and corresponding structure at filing would help clarify "vague" software patents).

structure. It also clarifies the role of the person of ordinary skill in the art ("POSITA") in this analysis. Finally, Part III establishes how the Federal Circuit can use existing law to invalidate overly broad patents, and emphasizes the recent ways that the Federal Circuit has done so by heightening the requirements imposed on means-plus-function claims for computer-implemented functions.

I. HISTORICAL BACKGROUND OF FUNCTIONAL CLAIMING

To understand the evolution of functional claiming and the scope of its permissibility, it is important to grasp how the patent system has come to adopt claims as the defining source of inventors' ownership rights.[34]

A. EVOLUTION OF THE PRACTICE OF CLAIMING ONE'S INVENTION

Prior to 1790, "nothing in the nature of a claim had appeared either in British patent practice or in that of the American states."[35] The practice of writing formal claims only emerged over the following decades through "applicant practice spurred by judicial scrutiny of vague patents."[36] Additionally, the Patent Office contributed to the evolution of patent claims.[37] The 1790 Patent Act made no mention of formal claims, but rather focused on a description of the invention.[38] Three years later, in 1793, Congress revised the patent act, requiring that inventors provide a written description

> in such full, clear and exact terms, as to distinguish the same from all other things before known, and to enable any person skilled in

34. *See* Anderson & Menell, *supra* note 7, at 4 n.1 ("The late Judge Giles S. Rich, an architect of 1952 Patent Act and long-serving member of the Court of Appeals for the Federal Circuit (and its predecessor court, the Court of Customs and Patent Appeals), famously noted that "the name of the game is the claim." (citations omitted)).

35. *Id.* at 10 (quoting Karl B. Lutz, *Evolution of the Claims of U.S. Patents*, 20 J. PAT. OFF. SOC'Y 134, 134 (1938)).

36. *Id.* (citing William R. Woodward, *Particularity and Definiteness in Patent Claims*, 46 MICH. L. REV. 755, 758 (1948) (citations omitted)). The authors also note:

> Although this language of the act, and later the decisions of the courts, in time encouraged a good many inventors to include statements more or less in the nature of a claim as part of the patent document, for several decades a good many patents were issued without anything in the nature of a claim.

Id.

37. *Id.*

38. *Id.* at 10–11.

> the art or science, of which it is a branch, or with which it is most nearly connected, to make, compound, and use the same.[39]

However, the earliest patents only described the invention in general terms. The "earliest suggestion of the claim," as Karl Lutz explained, "was the inclusion in the description of a statement that the patentee did not intend to be limited to the specific disclosure of the patent."[40] Lutz and other scholars have credited Robert Fulton with the invention of the formal claim when, in his 1811 patent for the steamboat, he stated:

> Having been the first to demonstrate the superior advantages of a water wheel or wheels, *I claim* as my exclusive right, the use of two wheels, one over each side of the boat to take purchase on the water . . . .[41]

Slowly, other patent drafters began including formal claims at the end of their applications, and by the late 1820's it was common practice for the patentee to follow this procedure.[42] Further cementing this into patent doctrine, Dr. Thomas P. Jones, the newly appointed Superintendent of the Patent Office, published an article in 1828 for the purpose of instructing patent applicants.[43] He explained that "the patentee should distinctly set forth what he claims as new; and this is best done in a separate paragraph, at the end of the specification . . . ."[44]

B. THE SHIFT FROM CENTRAL TO PERIPHERAL CLAIMING

In the early Nineteenth Century, however, the patent system was based on central,[45] rather than peripheral, claiming.[46] The 1836 Act required applicants to "particularly *specify and point out* the part, improvement, or

39. *Id.* at 11 (quoting Patent Act of Feb. 21 1793, ch. 11 § 3, 1 Stat. 318).

40. *See id.* at 11 (citing Lutz, *supra* note 35, at 135 (describing a 1799 patent)).

41. *Id.* at 12 (citing Woodward, *supra* note 36, at 758 (describing Fulton's patent granted on Feb. 9, 1811) and Lutz, *supra* note 35, at 136–37 (commenting that "Fulton can perhaps more properly be credited with invention of the 'claim' than of the steamboat")).

42. *Id.* at 12–14.

43. *Id.* at 13–14 (citing Thomas P. Jones, *Information to Persons Applying for Patents, or Transacting Other Business at the Patent Office*, 6 FRANKLIN J. & AM. MECH. MAG. 332, 334 (1828)).

44. *Id.*

45. *See* Dan L. Burk & Mark A. Lemley, *Fence Posts or Sign Posts? Rethinking Patent Claim Construction*, 157 U. PA. L. REV. 1743, 1747 (2009) ("Whereas peripheral claiming purports to mark the outermost boundary of the patentee's claims, central claiming describes the core or gist of the patentee's contribution to technology.").

46. *See id.*

combination which he claims as his own invention or discovery."[47] Patentees began using "reference characters," which were alphanumeric labels on the patent drawings to specify their particular improvement.[48] However, during this time, the patent was defined by what the patentee actually built, rather than by its claims.[49] Some patentees during this time used peripheral claiming, in which they used linguistic formulations rather than specific references to define the boundaries of their claims.[50] The Patent Act of 1870 "formalized the use of patent claims by requiring applicants to 'particularly point out and distinctly *claim* the part, improvement, or combination which he claims as his invention or discovery.' "[51]

In 1877, the Court formally acknowledged the importance of the public notice function of patents, and confirmed that the scope of patent protection is linked to that which is disclosed in the claims rather than what the applicant actually constructed.[52] In *Merrill v. Yeomans*, the plaintiff claimed a process for the manufacture of deodorized heavy hydrocarbon oils.[53] The accused infringer did not manufacture the oils in accordance with the claimed process, but instead sold deodorized heavy hydrocarbon oils. Because these oils were described in the specification, the plaintiff sued for infringement.[54] Notably, the Court stated that the "distinct and formal claim is . . . of primary importance . . . in the effort to ascertain precisely what it is that is patented to the appellant in this case."[55] To this extent, the Court held that the defendant did not infringe the plaintiff's claimed invention, as they did not manufacture the oils using the claimed process.[56] Markedly, the decision in *Merrill* emphasized the importance of the notice function of patents, stating that "[t]he public should not be deprived of rights supposed to belong to it,

47. Anderson & Menell, *supra* note 7, at 15 (citing Patent Act of 1836, ch. 357, § 6, 5 Stat. 117, 119 (emphasis added); Lutz, *supra* note 35, at 143 ("This addition to the statute had no immediate effect on the form or substance of claims because it was understood as merely codifying the existing law which had been developed by the courts.")).

48. *Id.* (citing RISDALE ELLIS, PATENT CLAIMS §§ 3, 5 (1949)).

49. *Id.* at 16.

50. *Id.* at 17.

51. *Id.* at 17 (quoting Patent Act of 1870, ch. 230, § 26, 116 Stat. 198, 201 (emphasis added)).

52. *See* Merrill v. Yeomans, 94 U.S. 568, 573 (1877) ("The public should not be deprived of rights supposed to belong to it, without being clearly told what it is that limits these rights."); Keystone Bridge Co. v. Pheonix Iron Co., 95 U.S. 274 (1877); *see also* Anderson & Menell, *supra* note 7, at 21–22.

53. *See Merrill*, 94 U.S. at 570.

54. *Id.* at 568.

55. *Id.*

56. *Id.* at 573–74.

without being clearly told what it is that limits these rights."[57] This decision eventually brought claim construction to the forefront of patent litigation and contributed to the decline of centralized claiming.[58] Patentees became more likely to rely on peripheral claiming to define the outer limits of their invention, and over the next century the courts developed rules for construing patent claims.[59]

C. DEVELOPMENT OF FUNCTIONAL CLAIMING

Because a claim defines the outer boundaries of a patentee's invention, the patentee has an incentive to define these boundaries as broadly as possible in order to obtain exclusive rights over more material.[60] This concept encourages patentees to define their invention in functional terms rather than in technical terms.[61] Functional claiming is desirable for patentees as it potentially allows one to obtain exclusive rights over every way of performing the claimed function, regardless of whether they actually invented a specific method for achieving the desired outcome.[62] However, in 1946, the Supreme Court rejected this practice in *Haliburton Oil Well Cementing Co. v. Walker*, holding that a patentee may not define a claim by using functional language.[63] The Court emphasized the lack of an accurate description of the invention, and declared that "a patentee cannot obtain greater coverage by failing to describe his invention than by describing it as the statute commands."[64] This momentarily put a stop to the practice of functional claiming, but six years later Congress passed the Patent Act of 1952, which permits functional claiming provided that specific requirements are met.[65] 35 U.S.C. § 112(f) states that:

> An element in a claim for a combination may be expressed as a means or step for performing a specified function without the

57. *See id.* at 573.

58. *See* Anderson & Menell, *supra* note 7, at 17 (discussing the rise of peripheral claiming).

59. *Id.* at 23 (citing William Callyhan Robinson, 2 THE LAW OF PATENTS FOR USEFUL INVENTIONS 115 (1890)).

60. *See id.* at 4 ("As a result, patent prosecutors devote substantial effort to crafting patent claims that maximize scope while differentiating prior art."); *see also* Lemley, *supra* note 9, at 1–2 ("And lawyers have a natural tendency to broaden those claims as much as possible in order to secure the strongest possible rights for their clients.").

61. Lemley, *supra* note 9, at 7.

62. *See id.* at 2–3 ("Put another way, patentees were claiming to own not a particular machine, or even a particular series of steps for achieving a goal, but the goal itself.").

63. Haliburton Oil Well Cementing Co. v. Walker, 329 U.S. 1, 9–10 (1946).

64. *Id.* at 13.

65. *See* 35 U.S.C. § 112(f).

> recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.[66]

The new Act allowed functional claiming (i.e. means-plus-function claiming) at the point of novelty, subject to certain conditions, and it rendered *Haliburton* obsolete with regard to that holding.[67] Patentees were once again permitted to claim a function without reciting its structure in the claim, provided that they disclosed adequate corresponding structure in the specification that was linked to the claimed function.[68]

A means-plus-function claim must also meet the requirements of § 112(b) in order to avoid being ruled indefinite.[69] This provision states that a patentee must "particularly point out and distinctly claim" the invention.[70] Taken together, § 112(b) and (f) have been interpreted to require that

> if one employs the means-plus-function language in a claim, one must set forth in the specification an adequate disclosure showing what is meant by that language. If an applicant fails to set forth an adequate disclosure, the applicant has in effect failed to particularly point out and distinctly claim the invention as required by the second paragraph of section 112.[71]

Disclosure of corresponding structure in the specification that "clearly links or associates that structure to the function recited in the claim" is viewed by the Federal Circuit as "quid pro quo" for the convenience of using the means-plus-function claim format.[72] Therefore, a patentee is allowed to use functional claiming, but must pay the price by limiting his claimed invention to specific structures that are disclosed. If this price is not paid, the claim will be ruled indefinite under § 112(b).

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66. *Id.*

67. Lemley, *supra* note 9, at 11 n.32–33; *see also In re* Donaldson Co., Inc., 16 F.3d 1189, 1194 (Fed. Cir. 1994) ("In *Haliburton* . . . the Supreme Court held that means-plus-function language could not be employed at the exact point of novelty in a combination claim. Congress enacted paragraph six [of the Patent Act] . . . to statutorily overrule that holding.").

68. *See* 35 U.S.C. § 112(f).

69. *In re Donaldson Co., Inc.*, 16 F.3d at 1195 ("Although paragraph six statutorily provides that one may use means-plus-function language in a claim, one is still subject to the requirement [in paragraph two] that a claim 'particularly point out and distinctly claim' the invention.").

70. 35 U.S.C. § 112(b).

71. *In re Donaldson Co., Inc.*, 16 F.3d at 1195.

72. B. Braun Med., Inc. v. Abbott Labs., 124 F.3d 1419, 1424 (Fed. Cir. 1997).

II. CONSTRUING MEANS-PLUS-FUNCTION CLAIMS FOR COMPUTER-IMPLEMENTED INVENTIONS

Functional claiming is particularly problematic in software patents because "software is an *abstract* technology."[73] It can be difficult to describe the invention, so patentees often resort to abstract language.[74] Patentees sometimes use means-plus-function claims to limit their claims to the specific structures described.[75] However, software patentees, in particular, often use functional claiming like that which the Court rejected in *Haliburton*.[76] Because they neglect to use the means-plus-function format, the courts do not look to the specification to find the corresponding structure even though the patentee uses functional language in the claims.[77] The Federal Circuit has devised a process for construing means-plus-function claims and specific requirements for those involving computer-implemented functions, and strict application of this doctrine to all functional claims (whether or not they are written in means-plus-function format) has been proposed as a potential solution to the software patent problem.[78] However, the law interpreting means-plus-function claims is incredibly complex and seemingly inconsistent. This Part attempts to clarify the doctrine.

When construing means-plus-function claims, the court first identifies the claimed function.[79] In doing this, the court "construe[s] the function of a means-plus-function limitation to include the limitations contained in the claim language, and only those limitations."[80] Next, the court identifies "the corresponding structure in the written description of the patent that performs that function."[81] In this step, the disclosed structure is only considered the corresponding structure if "the specification or prosecution history clearly links or associates that structure to the function recited in the

73. BESSEN & MEURER, *supra* note 1, at 187.

74. *Id.* at 203.

75. *See id.* at 204–11.

76. *See* Lemley, *supra* note 9, at 15–19 (providing examples of this type of functional claiming); *see id.* at 19 ("Software patents, then, have brought back functional claiming as it existed before 1952.").

77. *Id.*

78. *See id.* at 42–43.

79. *See* Applied Med. Res. Corp. v. U.S. Surgical Corp., 448 F.3d 1324, 1332 (Fed. Cir. 2006).

80. Cardiac Pacemakers, Inc. v. St. Jude Med., Inc., 296 F.3d 1106, 1113 (Fed. Cir. 2002).

81. *See Applied Med. Res. Corp.*, 448 F.3d at 1332.

claim."[82] The identification of the corresponding structure in the specification is the most crucial part of the court's analysis, as it is the point when the court determines the scope of the patentee's invention and has the ability to hold claims that do not reference sufficient structure (or any structure) invalid.[83] It is also the point where the case law is most confusing and inconsistent. Before delving into these concepts and clarifying the law in this area, it is important to outline the Federal Circuit's specific requirements for computer-implemented functions.

A. SPECIFIC DISCLOSURE REQUIREMENTS FOR COMPUTER-IMPLEMENTED FUNCTIONS

1. Definition of Corresponding Structure for Computer-Implemented Functions

In 1992, the Federal Circuit attempted to construe the corresponding structure for a means-plus-function claim where the function was implemented by a computer.[84] In *In re Hayes Microcomputer Products, Inc. Patent Litigation*, the claims at issue recited the terms "timing means" and "means operative."[85] Hayes, the patentee, asserted that the claims were definite because the specification contained sufficient structure by disclosing a "microprocessor."[86] The defendant, Ven Tel, argued that the claims failed to meet the written description requirement under § 112(a), and that the means-plus-function claims were indefinite under § 112(f) for a lack of corresponding structure disclosed in the specification.[87] Ven Tel insisted that Hayes must disclose the firmware that would implement the claimed function in the microprocessor,[88] and argued that "a microprocessor is defined by its programmable resources and, without programmed firmware, the microprocessor has no special functionality."[89] The court "disagree[d]

82. Med. Instrumentation & Diagnostics Corp. v. Elekta AB, 344 F.3d. 1205, 1210 (Fed. Cir. 2003) (quoting B. Braun Med., Inc. v. Abbott Labs., 124 F.3d 1419, 1424 (Fed. Cir. 1997)).

83. *See, e.g.*, Noah Sys, Inc. v. Intuit, Inc., 675 F.3d 1302, 1319 (Fed. Cir. 2012) (holding a claim indefinite because there was a "total absence of structure"); Finisar Corp. v. DirecTV Group, Inc., 523 F.3d 1323, 1341 (Fed. Cir. 2008) (holding a claim indefinite because it did not contain "any corresponding structure"); Aristocrat Techs. v. Int'l Game Tech., 521 F.3d 1328, 1338 (Fed. Cir. 2008) (holding the claim indefinite for not "disclosing any algorithm at all").

84. *See In re* Hayes Microcomputer Prods., Inc. Patent Litig., 982 F.2d 1527, 1531–32 (Fed. Cir. 1992).

85. *Id.* at 1531.

86. *Id.* at 1533.

87. *Id.* at 1533–35.

88. *Id.* at 1534.

89. *Id.*

with Ven Tel's contention that to satisfy section 112, a statement as to the specific function of a microprocessor is inadequate."[90] The Federal Circuit held that the means-plus-function claims were not indefinite, as Hayes disclosed sufficient structure by disclosing a programmable microprocessor.[91]

Following the *Hayes* decision, it was widely understood that disclosing a programmable microprocessor to carry out the claimed function was a sufficient disclosure under § 112(b) and (f).[92] "Many thousands—perhaps hundreds of thousands" of patents for computer-implemented functions were written based on this understanding of the law,[93] but these patents may not meet the increasingly heightened disclosure requirements that the Federal Circuit has declared after *Hayes*.[94]

Markedly, in a sharp departure from *Hayes*, the Federal Circuit imposed heightened disclosure requirements in *WMS Gaming Inc. v. International Game Technology* by requiring a disclosed algorithm.[95] The patent in question in *WMS Gaming* disclosed a microprocessor that controlled the operation of a slot machine and contained a claim that employed the phrase "means for assigning."[96] The patentee described the algorithm controlling the assignment of numbers to a stop position as a four-step process diagramed in the specification.[97] The Federal Circuit held that the district court incorrectly construed the "means for assigning" limitation to cover "'any table, formula, or algorithm for determining correspondence between the [randomly selected] numbers and rotational positions of the reel.' "[98] The Federal

90. *Id.*

91. *Id.* at 1534–35.

92. Peter C. Schechter, *U.S. Court of Appeals for the Federal Circuit Adds 'Grievous Unreliability' to 'Hundreds of Thousands' of Patents*, BNA INSIGHTS (Oct. 19, 2012), http://iplaw.bna.com/iprc/display/story_list.adp?mode=ins&frag_id=28420752&prod=ipin ("The meaning and significance of the Hayes Microcomputer decision was clear to both the PTO and patent practitioners alike: naming a suitable programmable microprocessor that could be programmed by a person skilled in the art to carry out the disclosed and claimed method steps was sufficient disclosure under 35 U.S.C. §112[(b),(f)].").

93. *Id.*

94. *Id.* ("[By 2003,] it was no longer sufficient to simply identify a generic programmable microprocessor and the functions that it was to perform after being suitably programmed by an ordinarily skilled software engineer according to known programming techniques.").

95. *See* WMS Gaming Inc. v. Int'l Game Tech., 184 F.3d 1339, 1348 (Fed. Cir. 1999).

96. *Id.* at 1346, 1348.

97. *Id.* at 1348 ("1) [T]he range of single numbers exceeds the number of stop positions; 2) each single number is assigned to only one stop position; 3) each stop position is assigned at least one single number; and 4) at least one stop position is assigned more than one single number.").

98. *Id.* (quoting WMS Gaming Inc. v. Int'l Game Tech., 1996 WL 539112, at *11 (N.D. Ill. Sept. 20, 1996)).

Circuit clarified that the district court's interpretation was "overly broad," as it allowed a "lack of disclosure to indicate that the limitation reads on any means for performing the recited function."[99] Essentially the district court's interpretation would have allowed the party to claim any means for performing the claimed function, but the Federal Circuit found that this was "at odds with the requirements of 35 U.S.C. § 112."[100] Departing from its *Hayes* opinion, the Federal Circuit made clear in *WMS Gaming* that if a patentee chooses to use means-plus-function claiming, he cannot evade the requirement of providing corresponding structure in the specification by simply asserting that the corresponding structure is a computer.[101] The court reasoned that "[a] general purpose computer, or microprocessor, programmed to carry out an algorithm 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.' "[102] The "new machine" is limited by the algorithm disclosed in the specification.[103] The new rule essentially adopts Ven Tel's unsuccessful argument in *Hayes*,[104] and limits the corresponding structure to the specific algorithm disclosed in the specification.[105]

2. Definition and Disclosure Requirements for an Algorithm

The term "algorithm" in computer systems has a broad meaning, "for it encompasses 'in essence a series of instructions for the computer to follow.' "[106] In *Application of Freeman*, the court recognized that the preferred definition of "algorithm" in the computer art is "[a] fixed step-by-step procedure for accomplishing a given result; usually a simplified procedure for solving a complex problem, also a full statement of a finite number of

99. *Id.* at 1348.

100. *Id.*

101. *Id.*

102. *Id.* (quoting In re Alappat, 33 F.3d 1526, 1545 (Fed. Cir. 1994) (en banc)).

103. *Id.*; *see also* Harris Corp. v. Ericsson Inc., 417 F.3d 1241, 1253 (Fed. Cir. 2005) ("A computer-implemented means-plus-function term is limited to the corresponding structure disclosed in the specification and equivalents thereof, and the corresponding structure is the algorithm.").

104. *See In re* Hayes Microcomputer Products, Inc. Patent Litigation, 982 F.2d at 1534 (arguing that "to satisfy section 112, a statement as to the specific function of a microprocessor is inadequate, that the actual program must be disclosed").

105. *See Harris*, 417 F.3d at 1253.

106. Typhoon Touch Techs., Inc. v. Dell, Inc., 659 F.3d 1376, 1384 (Fed. Cir. 2011) (quoting *In re* Waldbaum, 457 F.2d 997, 998 (C.C.P.A. 1972)).

steps."[107] A patentee may "express that algorithm in any understandable terms including as a mathematical formula, in prose . . . or as a flow chart, or in any other manner that provides sufficient structure."[108] The patentee need not disclose specific mathematical formulas or source code,[109] but if the algorithm disclosed in the specification merely provides functional language and does not contain any step-by-step procedure, the court will rule the claim indefinite for lack of corresponding structure.[110] When a patentee claims a function, the specification must disclose how that function is performed,[111] otherwise, the language "describes an outcome, not a means for achieving that outcome."[112]

3. Exception to the Requirement that an Algorithm Must be Disclosed

Recently, the Federal Circuit announced a narrow exception to the rule requiring the disclosure of algorithm for computer-implemented functions.[113] In *In re Katz Interactive Call Processing Patent Litigation*, the court observed that if a claimed function can be performed by "any general purpose computer without special programming . . . it [is] not necessary to disclose more structure than the general purpose processor that performs those functions."[114]

107. Application of Freeman, 573 F.2d 1237, 1246 n.8 (C.P.P.A. 1978) (quoting C. SIPPL & C. SIPPL, COMPUTER DICTIONARY AND HANDBOOK (1972)); *see also Typhoon Touch*, 659 F.3d at 1385.

108. Finisar Corp. v. DirecTV Group, Inc., 523 F.3d 1323, 1340 (Fed. Cir. 2008).

109. *Typhoon Touch*, 659 F.3d at 1385 ("For computer-implemented procedures, the computer code is not required to be included in the patent specification.").

110. *See, e.g.*, Ergo Licensing, LLC v. CareFusion 303, Inc., 673 F.3d 1361, 1365 (Fed. Cir. 2012) ("The specification merely provides functional language and does not contain any step-by-step process for controlling the adjusting means."); *In re* Keisuke Aoyama, 656 F.3d 1293, 1298 (Fed. Cir. 2011) (citing *Ex parte Aoyama*, No. 2009–6755, slip op. at 5 (B.P.A.I. June 16, 2010) ("*Decision on Rehearing*")) ("Figure 8 only 'presents several results to be obtained, without describing how to achieve those results, and certainly not how to generate transfer data.' "); Blackboard, Inc. v. Desire2Learn, Inc., 574 F.3d 1371, 1383 (Fed. Cir. 2009) (explaining that the disclosure is "simply an abstraction that describes the function"); Aristocrat Techs. v. Int'l Game Tech., 521 F.3d 1328, 1334 (Fed. Cir. 2008) ("But that language simply describes the function to be performed, not the algorithm by which it is performed.").

111. *Blackboard*, 574 F.3d at 1384 ("The ACM is essentially a black box that performs a recited function. But *how* it does so is left undisclosed.") (emphasis added).

112. *Aristocrat*, 521 F.3d at 1334.

113. *See In re* Katz Interactive Call Processing Patent Litigation, 639 F.3d 1303, 1316 (Fed. Cir. 2011).

114. *Id.* at 1316 (citations omitted).

The disputed claims in *Katz* recited the functions of "processing," "receiving," and "storing."[115] The court reasoned that because those functions were "coextensive with the structure disclosed, i.e., a general purpose processor," they did not "run afoul of the rule against purely functional claiming."[116] The court held that the District Court had interpreted *WMS Gaming* too broadly in requiring the disclosure of an algorithm for any computer-implemented function.[117] The rule is limited to when the function is implemented by "programming a general purpose computer to convert it into a special purpose computer capable of performing those specified functions."[118]

B. DETERMINATION OF WHETHER THE SPECIFICATION CONTAINS STRUCTURE THAT IS CLEARLY LINKED TO THE FUNCTION

In *Atmel Corp. v. Info Storage Devices, Inc.*, the Federal Circuit clarified that when looking for the corresponding structure in the specification, "the inquiry asks first whether structure *is* described in the specification, and, if so, whether one skilled in the art would identify the structure from that description."[119] Furthermore, in *Medical Instrumentation & Diagnostics Corp. v. Elekta AB*, the Federal Circuit clarified that a structure must be "clearly linked" with the claimed function in order to meet the requirement of § 112(b) that the specification particularly point out and distinctly claim the invention, and to satisfy the quid pro quo of § 112(f).[120]

In *Medical Instrumentation*, the district court construed the structure for the function in question to be the "framegrabber, the CVP, and '[s]oftware routines for converting digital-to-digital known to those of skill in the art.' "[121] The district court concluded that "because techniques for performing those conversions were known to those of skill in the art at the

115. *Id.*

116. *Id.*

117. *Id.*

118. *Id.* (citing Aristocrat Techs. v. Int'l Game Tech., 521 F.3d 1328, 1333–34 (Fed. Cir. 2008); Harris Corp. v. Ericsson Inc., 417 F.3d 1241, 1253 (Fed. Cir. 2005); WMS Gaming Inc. v. Int'l Game Tech., 184 F.3d 1339, 1349 (Fed. Cir. 1999)).

119. Atmel Corp. v. Info Storage Devices, Inc., 198 F.3d 1374, 1381 (Fed. Cir. 1999).

120. Med. Instrumentation & Diagnostics Corp. v. Elekta AB, 344 F.3d 1205, 1211 (Fed. Cir. 2003) ("The duty of a patentee to clearly link or associate structure with the claimed function is the quid pro quo for allowing the patentee to express the claim in terms of function under section 112[(f)].") ("The requirement that a particular structure be clearly linked with the claimed function in order to qualify as corresponding structure is also supported by the requirement of 35 U.S.C. § 112 [(b)] that an invention must be particularly pointed out and distinctly claimed.").

121. *Id.* at 1210.

time the application was filed, a person of skill in the art would understand software to be a corresponding structure for the converting function."[122] Elekta's product used software to achieve Medical Instrumentation's claimed function, so the district court held that Elekta was infringing.[123]

On appeal, the Federal Circuit ruled that this was an error, and held that the software should not have been considered a corresponding structure because it was not clearly linked to the claimed function.[124] The Federal Circuit reasoned that it is the patentee's duty "to clearly link or associate [the] structure with the claimed function" in order to take advantage of the functional claiming allowed under § 112(f).[125] Although the claims were not ruled indefinite (because the framegrabber and CVP still constituted sufficient structure), when software was eliminated from the claimed structures, the judgment of infringement was reversed.[126]

The Federal Circuit relied on *Atmel*, declaring that "[i]t is not proper to look to the knowledge of one skilled in the art apart from and unconnected to the disclosure of the patent."[127] The court emphasized that the focus is on the *disclosure* of the patent encompassing software, not merely whether a POSITA would be able to write a software program.[128] Medical Instrumentation pointed to three instances in the disclosure that they argued weighed in favor of holding software to be the corresponding structure. They argued that the "Image Format Conversion" box in a block diagram and a written reference to "image format conversion" disclosed software that corresponded to the conversion function.[129] The court disagreed, finding that this did not describe a structure at all, and could not clearly link software as the corresponding structure.[130] Medical Instrumentation further sought to

122. *Id.* at 1211.
123. *Id.* at 1209.
124. *Id.* at 1222.
125. *Id.* (citing Budde v. Harley-Davidson, Inc., 250 F.3d 1369, 1377 (Fed. Cir. 2001)).
126. *Id.* at 1222.
127. *Id.* at 1212. The Federal Circuit explained:

> The correct inquiry is to look at the *disclosure* of the patent and determine if one of skill in the art would have understood that *disclosure* to encompass software for digital-to-digital conversion and been able to implement such a program, not simply whether one of skill in the art would have been able to write such a software program . . . . It is important to determine whether one of skill in the art would understand the specification itself to disclose the structure, not simply whether that person would be capable of implementing that structure.

Id.
128. *Id.*
129. *Id.* at 1212–13, 1215.
130. *Id.* at 1213, 1215.

utilize a reference to "image editing" within its specification as a source for disclosing software as the corresponding structure.[131] This part of the specification stated:

> The division for image acquisition enhancement, and manipulation includes modular *software subroutines* for: 1) image capture, storage, and archiving; 2) pixel analysis for an entire image or user-defined areas of interest; 3) zoom and pan functions; 4) contrasting and filtering images with functions for smoothing, sharpening, and pseudocoloring; 5) image comparisons; 6) *image editing*; and 7) various edge detection routines . . . .[132]

The court reasoned that while this portion of the specification did describe software, it was not linked to the function because there was "no evidence that a person of skill in the art would understand the use of the phrase 'image editing' as a reference to the function of converting images into a selected digital format."[133] While ruling on the linkage issue, the court also noted:

> This may be a different case if the specification contained a statement suggesting that digital-to-digital conversion can be performed by software programs known to those of skill in the art. A statement in the specification referring to the knowledge of those skilled in the art specific to the claimed function would put it closer to the lines we have drawn in other cases such as *Atmel*.[134]

However, this dicta does not go to the issue of whether the structure is clearly linked to the function; rather, it speculates that if that linkage were established, then "software programs known to those of skill in the art" could be sufficient disclosure if one skilled in the art would know "the kind of program to use."[135] This is referring to step two of the *Atmel* procedure.[136] As discussed in Section III.A, in *AllVoice Computing PLC v. Nuance Communications, Inc.*,[137] the Federal Circuit later solidifies this concept in an opinion written by Judge Newman.

131. *Id.* at 1215.

132. *Id.* (citing '684 patent, col. 11, ll. 36–44 (emphases added)).

133. *Id.*

134. *Id.* at 1217.

135. *See id.*

136. *See* Atmel Corp. v. Info. Storage Devices, Inc., 198 F.3d 1374, 1381 (Fed. Cir. 1999) ("whether one skilled in the art would identify the structure from that description").

137. AllVoice Computing PLC v. Nuance Commc'ns, Inc., 504 F.3d 1236 (Fed. Cir. 2007).

In her dissent in *Medical Instrumentation*, Judge Newman emphasized this point further,[138] but claimed that this has been the rule for decades.[139] She scoffed at the court's "inappropriate conditions for computer-based inventions"[140] and asserted that the court now required even more, but that it "it [was] far from clear" what that was.[141]

C. CONSIDERATION OF THE KNOWLEDGE OF A POSITA

When analyzing claims using the *Atmel* procedure, it can be unclear at what point to consider the knowledge of a POSITA. In *Atmel*, the Federal Circuit explained that "the 'one skilled in the art' analysis should apply in determining whether sufficient structure has been disclosed to support a means-plus-function limitation."[142] The court reasoned that the analysis under § 112 is a matter of claim construction, and that claims are construed in "view of the understanding of one skilled in the art."[143]

After highlighting the two-step procedure that courts should take to determine if a specification contains some structure and what that structure is, the court in *Atmel* next explained the difference between looking to (1) the knowledge of a POSITA to identify structure under the § 112(f) analysis and (2) the enablement requirement of § 112(a).[144] The court explained that paragraph (a) has an "expansive purpose" and allows resort to material outside of the specification to satisfy the enablement requirement.[145] The court reasoned that there "it makes no sense to encumber the specification of a patent with all the knowledge of the past concerning how to make and

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138. *Med. Instrumentation*, 344 F.3d at 1223 (Newman, J., dissenting) (citing Minnesota Mining & Manufacturing Co. v. Chemque, Inc., 303 F.3d 1294, 1301 (Fed. Cir. 2002)). Judge Newman asserted:

> The patent specification need not "teach software" and the writing of routine programs in order to teach how to practice the described method. It suffices if one of skill in the art "would have been able to write" a standard program of digital-to-digital conversion. If one of skill in the programming art would have been able to write such a program without undue experimentation, the statutory requirements are met.

Id.

139. *Id.* at 1224.

140. *Id.* at 1223.

141. *Id.* at 1224–25 ("Is this court now requiring a five-foot-shelf of zeros and ones?").

142. Atmel Corp. v. Info Storage Devices, Inc., 198 F.3d 1374, 1379 (Fed. Cir. 1999).

143. *Id.* (citing Personalized Media Commc'ns, LLC v. Int'l Trade Comm'n, 161 F.3d 696, 705 (Fed. Cir. 1998); Chiuminatta Concrete Concepts, Inc. v. Cardinal Indus., Inc., 145 F.3d 1303, 1308 (Fed. Cir. 1998); K2 Corp. v. Salomon S.A., 191 F.3d 1356, 1365 (Fed. Cir. 1999)).

144. *See id.* at 1382. *See supra* note 21.

145. *Atmel Corp.*, 198 F.3d at 1382.

use the claimed invention."[146] However, because § 112(f) sets forth a "simple requirement" of stating "some structure" in order to take advantage of the means-plus-function format, a court may not look to the knowledge of a POSITA *outside of the specification* to determine if structure is disclosed.[147] A slight increase in the amount of written description in the specification to overcome a complete omission of structure is the "trade-off" for taking advantage of the functional claiming allowed under § 112(f).[148] Outside knowledge of a POSITA is only used "in relation to structure that is disclosed in the specification" once it has been determined that structure *is* disclosed.[149]

In *Aristocrat Technologies Australia Pty Ltd. v. International Game Technology*, the court addressed the continued confusion between the enablement requirement of § 112(a)[150] and the role of the POSITA in determining whether sufficient structure is disclosed in analysis of means-plus-function claims under § 112(f).[151] In that case, the disputed claim terms were "game control means" or "control means," and the plaintiffs argued that the corresponding structure in the specification was "any standard microprocessor base [sic] gaming machine [with] appropriate programming."[152] Aristocrat put forward two arguments: first, that "the specification disclosed algorithms sufficient to constitute a qualifying disclosure of structure," and second, that "no disclosure of specific algorithms was necessary in any event."[153] In response to Aristocrat's first argument, the court declared that all of the mathematical formulas that Aristocrat argued were algorithms were merely restatements of the desired outcome, and were not corresponding structure but rather impermissible attempts at functional claiming.[154] In response to Aristocrat's second argument, the court further clarified the role of the knowledge of a POSITA in a means-plus-function claim construction analysis.[155] The court explained

146. *Id.*
147. *Id.*
148. *Id.*
149. *Id.*
150. *See supra* note 21 regarding the nomenclature of § 112.
151. Aristocrat Techs. Australia Pty Ltd. v. Int'l Game Tech., 521 F.3d 1328, 1336 (Fed. Cir. 2008).
152. *Id.* at 1332–33.
153. *Id.* at 1334. The court formulated that "Aristocrat's real point is that devising an algorithm to perform that function would be within the capability of one of skill in the art, and therefore it was not necessary for the patent to designate any particular algorithm to perform the claimed function." *Id.*
154. *Id.* at 1334–35.
155. *Id.* at 1336.

that although the patent may enable a POSITA to make and use the invention, there was still no structure disclosed for the purpose of construing the means-plus-function claim.[156] The court further explained that while it was true that the "sufficiency of the disclosure of algorithmic structure must be judged in light of what one of ordinary skill in the art would understand the disclosure to impart," that concept did not apply when no structure or algorithm was initially disclosed in the specification.[157] The court clarified that the question in this case was whether an algorithm was disclosed *at all*, and that the knowledge of a POSITA did not play a role in that analysis "apart from and unconnected to the disclosure of the patent."[158] Because Aristocrat's disclosed "algorithm" was only a restatement of the claimed function, it was not considered structure at all.[159] Because no algorithm was stated at all, the court refused to look to the knowledge of a POSITA to determine if the algorithm was described with sufficient specificity.[160]

As demonstrated, the doctrine outlining this area of law is incredibly complex, and determinations hinge on very specific details. The courts must follow the procedure set forth and take into consideration the perspective of a POSITA at the relevant points of the analysis. If applied properly, this case law can be used to invalidate many overly broad patent claims and help solve some of the problems associated with software patents.[161]

III. HOW THE FEDERAL CIRCUIT CAN USE EXISTING LAW TO ALLEVIATE PROBLEMS WITH SOFTWARE PATENTS

Attempting to evolve at the pace of rapidly advancing technology, the case law outlining the Federal Circuit's requirements for computer-implemented means-plus-function claims is in a state of disarray. The Federal Circuit's decisions often turn on highly technical facts, making it difficult to

156. *Id.* ("Whether the disclosure would enable one of ordinary skill in the art to make and use the invention is not at issue here. Instead, the pertinent question in this case is whether Aristocrat's patent discloses structure that is used to perform the claimed function.").

157. *Id.* at 1337.

158. *Id.* (quoting Med. Instrumentation & Diagnostics Corp. v. Elekta *AB*, 344 F.3d 1205, 1212 (Fed. Cir. 2003)).

159. *Id.* at 1334–35 ("[T]he description of the embodiments is simply a description of the outcome of the claimed functions, not a description of the structure . . . .").

160. *Id.* at 1337–38 (explaining that although it is true that the "sufficiency of the disclosure of algorithmic structure must be judged in light of what one of ordinary skill in the art would understand the disclosure to impart" that principle is not relevant in this case because "a person of ordinary skill in the art would not recognize the patent as disclosing any algorithm at all").

161. *See* Lemley, *supra* note 9 at 39–43.

discern a clear set of rules about how the court will treat a disputed claim. Mark Lemley explained that courts could alleviate the problems associated with software patents by treating overly broad functional claims (such as "a computer for storing") as means-plus-function claims, despite the fact that they do not state the words "means for" and trigger the presumption that they should be analyzed in this way.[162] He explained that the current law for analyzing means-plus-function claims is capable of narrowly construing the scope of this type of claim and eliminating many overly broad claims that cause patent thickets[163] in the industry.[164] Indeed, as Section III.B will demonstrate, the Federal Circuit has addressed the problem of overly broad scope in computer-implemented functions by tightening its standard of what will constitute corresponding structure for means-plus-function claims. This Part highlights the intricacies of the court's previous applications of the *Atmel* procedure and discusses how the Federal Circuit has recently heightened requirements for computer-implemented inventions. By continuing down the path of heightening requirements, the courts will be able to invalidate overly broad software patents and provide notice to patentees of the requirements that they will have to fulfill in order to obtain ownership rights over a computer-implemented function.

A. THE FEDERAL CIRCUIT'S PREVIOUS APPLICATION OF THE *ATMEL* TWO-STEP PROCEDURE

The first step of the *Atmel* procedure—determining whether the specification contains structure *at all*[165]—is often the determinative point of the court's analysis.[166] The intricacies of the court's decisions and the inconsistencies become clearer with a factual breakdown of what the court has previously deemed to be considered no structure at all and what it has considered to be *some* structure, allowing the court to move to step two of the *Atmel* procedure—looking to outside knowledge of a POSITA to identify what that structure is.[167]

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162. *Id.*

163. A patent thicket is "a complex of overlapping patent rights that simply involves too many rights to cut through." *See* Lemley, *supra* note 9 at 24 (citing Carl Shapiro, *Navigating the Patent Thicket: Cross Licenses, Patent Pools, and Standard-Setting*, *in* 1 INNOVATION POLICY AND THE ECONOMY 119 (Adam Jaffe et al. eds., 2000)).

164. *See* Lemley, *supra* note 9, at 39–43.

165. *See* Atmel Corp. v. Info. Storage Devices, Inc., 198 F.3d 1374, 1381 (Fed. Cir. 1999).

166. *See* cases cited *supra* note 83 and accompanying text.

167. *Atmel*, 198 F.3d at 1381.

1. *No Structure Disclosed—Claims Invalidated in Step 1 of the* Atmel *Analysis*

In *Biomedino, LLC v. Waters Technologies Corp.*, the Federal Circuit rejected the argument that a specification stating that a claimed function can be performed by known methods or using known equipment had sufficient corresponding structure.[168] The court relied on the rule that "the testimony of one of ordinary skill in the art cannot supplant the total absence of structure from the specification."[169] In *Biomedino*, the claim language at issue was a "control means" and the relevant portion of the specification contained a figure with a box labeled "Control," along with a description stating that "the regeneration process may be 'controlled automatically by known differential pressure, valving and control equipment.' "[170] The court distinguished this case from *Atmel*, explaining that in that case there was undisputed expert testimony stating that the article title included in Atmel's specification conveyed the precise structure to a POSITA; the title constituted structure, so "[t]he expert's testimony did not create or infer the structure."[171] Here, conversely, there was nothing in the specification to suggest a structure at all for the control means, and the court would not allow one to be inferred from the knowledge of a POSITA.[172]

A similar result occurred in *Blackboard, Inc. v. Desire2Learn, Inc.*[173] The claims at issue stated "means for storing a plurality of data files" and "means for allowing access to and control of the data file," while the specification recited an "access control manager" as the corresponding structure.[174] Blackboard's argument that the "access control manager manages access control" and their expert testimony that "the name of it pretty much describes what it does" led the court to conclude that the structure was merely a recitation of the function, and that Blackboard was trying to claim "any computer-related device or program that performs the function of access control."[175] The court ruled the claim indefinite because the

168. Biomedino, LLC v. Waters Techs. Corp., 490 F.3d 946, 953 (Fed. Cir. 2007).

169. *Id.* at 950 (quoting Default Proof Credit Card Sys., Inc. v Home Depot U.S.A., Inc., 412 F.3d 1291, 1302 (Fed. Cir. 2005)).

170. *Id.* (quoting '502 patent, col. 11 ll.55–58).

171. *Id.* at 952 (citing Atmel Corporation v. Information Storage Devices, Inc., 198 F.3d 1374, 1382 (Fed. Cir. 1999)).

172. *Id.* at 952–53.

173. Blackboard, Inc. v. Desire2Learn, Inc., 574 F.3d 1371 (Fed. Cir. 2009).

174. *Id.* at 1382–83.

175. *Id.* at 1383.

specification failed to recite *how* the function was achieved.[176] The court reasoned:

> That ordinarily skilled artisans could carry out the recited function in a variety of ways is precisely why claims written in "means-plus-function" form must disclose the particular structure that is used to perform the recited function. By failing to describe the means by which the access control manager will create an access control list, Blackboard has attempted to capture any possible means for achieving that end. Section 112, paragraph 6, is intended to prevent such pure functional claiming.[177]

Likewise, in *Finisar Corp. v. DirecTV Group, Inc*, the claims in question included the limitation "database editing means . . . for generating . . . and for embedding," and the specification recited that "software 132 (executed by CPU 130) generates a hierarchical set of indices referencing all the data in the information database 112 and embeds those indices in the information database."[178] The court determined that this was merely a restatement of the function, and that "simply reciting 'software' without providing some detail about the means to accomplish the function is not enough."[179]

2. *Sufficient Structure Disclosed—Proceed to Step Two of the* Atmel *Analysis*

If the court finds that some structure is disclosed in the specification that is clearly linked to the claimed function, then it will proceed to step two of the *Atmel* procedure where it looks to the knowledge of a POSITA to identify the scope of that structure.[180] *AllVoice* provides a case in point in which the court held in that "[i]n software cases . . . algorithms in the

176. *Id.* at 1385–86.

177. *Id.* at 1385.

178. Finisar Corp. v. DirecTV Group, Inc., 523 F.3d 1323, 1340 (Fed. Cir. 2008) (emphasis omitted).

179. *Id.* at 1340–41. *But see* AllVoice Computing PLC v. Nuance Commc'ns, Inc., 504 F.3d 1236, 1245 (Fed. Cir. 2007) ("In software cases, therefore, algorithms in the specification need only disclose adequate defining structure to render the bounds of the claim understandable to one of ordinary skill in the art."); Med. Instrumentation & Diagnostics Corp. v. Elekta *AB*, 344 F.3d 1205, 1217 (Fed. Cir. 2003) ("This may be a different case if the specification contained a statement suggesting that digital-to-digital conversion can be performed by software programs known to those of skill in the art.").

180. *See* Atmel Corp. v. Info. Storage Devices, Inc., 198 F.3d 1374, 1381 (Fed. Cir. 1999).

specification need only disclose adequate defining structure to render the bounds of the claim understandable to one of ordinary skill in the art."[181]

Specifically, the court interpreted the function for AllVoice's claims in question as "determining positions of the recognized words . . . and for updating word positions after edits."[182] The specification contained a figure reciting steps, along with a written description stating "[t]he speech recognition interface application . . . receives the recognized word at the head of the alternative list shown in FIG. 3 and outputs the word using the dynamic data exchange 'DDE' protocol in the Windows operating system."[183] Uncontested expert testimony revealed that "[a] person skilled in the art reading the . . . specification would know that any of these techniques could be used to determine the position of a recognized word in the third party application, would know the software to use and how to implement it."[184] The court held that this was sufficient algorithmic structure.[185] The court looked to the knowledge of a POSITA at both steps of the *Atmel* analysis: first within the bounds of the specification to determine whether they would find structure at all[186] and then again to outside knowledge to determine what that structure was.[187] Furthermore, even though there was more than one possible known technique, the court did not hold the claim indefinite.[188] A contrary result was reached in a later case,[189] however, and the Federal Circuit appears to be heightening the requirements for means-plus-function claims.

181. *AllVoice*, 504 F.3d at 1245 (citing Med. Instrumentation & Diagnostics Corp. v. Elekta AB, 344 F.3d at 1214).

182. *Id.* at 1244.

183. *Id.* at 1241 (citing '273 Patent col.7 ll. 3–7).

184. *Id.* at 1246 (quoting Second Supplemental Sonnier Decl. ¶ 17).

185. *Id.* at 1245–46.

186. *See id.* at 1240 ("a means-plus-function clause is indefinite if a person of ordinary skill in the art would be unable to recognize the structure in the specification").

187. *See id.* at 1245–46 ("Thus, the record does contain sufficient algorithmic structure to give meaning to the claim terms form the vantage point of an ordinarily skilled artisan.").

188. *Id.* ("[A] person skilled in the art reading the 273 specification would know that any of these techniques could be used to determine the position of a recognized word in the third party application, would know the software to use and how to implement it.") (citations omitted).

189. *See* Ergo Licensing, LLC v. CareFusion 303, Inc., 673 F.3d 1361, 1364 (Fed. Cir. 2012) (holding that a "control device" was not a specific structure because there "were at least three different types of devices commonly available and used at the time to control adjusting means").

B. RECENT WAYS THAT THE FEDERAL CIRCUIT HAS HEIGHTENED REQUIREMENTS IN ORDER TO INVALIDATE CLAIMS AS OVERLY BROAD

Recently, the Federal Circuit has been addressing the problems of functional claiming in computer-implemented functions by strictly enforcing the means-plus-function requirements to invalidate overly broad patents.[190] By focusing on the first part of the *Atmel* analysis, and ruling that no structure has been disclosed *at all*, the court can avoid getting to step two, where it would consider the outside knowledge of a POSITA to identify the structure.[191] Step two of the analysis has the most potential to broaden the scope of the invention, as the structure claimed could be anything known to a POSITA. Recent cases have been successful in invalidating overly broad claims,[192] and have heightened the disclosure requirements in ways discussed below. This may bring the Federal Circuit one step closer to resolving the problem of overly broad functional claiming.

1. Ergo

In *Ergo Licensing, LLC v. CareFusion 303, Inc.*,[193] the court invalidated the claim in question and suggested heightened disclosure requirements in two ways: first, it limited the *Katz* exception to the rule that an algorithm must be disclosed,[194] and second, it implied that if a POSITA could identify more than one structure at step two of the *Atmel* analysis, the claim would be indefinite.[195]

190. *See, e.g.*, Ergo Licensing, 673 F.3d at 1365 (holding the claim indefinite for having no corresponding structure); Noah Systems, Inc. v. Intuit Inc., 675 F.3d 1302, 1318–19 (Fed. Cir. 2012) (holding that a specification had a "total absence of structure" when the "disclosed algorithm support[ed] some, but not all of the functions"); *In re* Keisuke Aoyama, 656 F.3d 1293, 1298 (Fed. Cir. 2011) (holding that the disclosed flowchart failed to provide any structure).

191. *See* Atmel Corp. v. Info. Storage Devices, Inc., 198 F.3d 1374, 1381 (Fed. Cir. 1999) (knowledge of one skilled in the particular art may be used to understand what structure(s) the specification discloses").

192. *See* cases cited *supra* note 190.

193. *Ergo Licensing*, 673 F.3d at 1361.

194. *Id.* at 1365 ("It is only in the rare circumstances where any general-purpose computer without any special programming can perform the function that an algorithm need not be disclosed.").

195. *Id.* at 1364. The court explained:

> In this case, Ergo's expert testimony illustrates that those skilled in the art would not recognize a "control device" as a known structure. Instead, Ergo's expert explained that there were at least three different types of control devices commonly available and used at the time to control

In *Ergo*, the Federal Circuit declared that the specification contained no corresponding structure.[196] Specifically, Ergo's claim stated "control means," and the court interpreted the function as "controlling the adjusting means."[197] Ergo argued that under *Katz*, "disclosure of an algorithm was not required, because a general-purpose computer [could] perform the function."[198] It pointed to the recitation of "control device" throughout the specification as corresponding structure and argued that a POSITA would find this synonymous with a general-purpose computer.[199] The court disagreed, finding that the "control device" was not the corresponding structure and that it merely replaced the word "means" with the word "device."[200] The court reasoned that a POSITA would not recognize a "control device" as a known structure, as "Ergo's expert explained that there were at least three different types of control devices commonly available and used at the time to control adjusting means: microprocessors, discrete circuits connected to stepper motors, and analog circuits."[201] The court further held that even if a control device was understood to be a general purpose computer, Ergo would still have been required to provide an algorithm and would not fall under the *Katz* exception.[202] Specifically, the court clarified that the *Katz* exception is a "narrow" one and that it is "only in the rare circumstances where any general-purpose computer without any special programming can perform the function that an algorithm need not be disclosed."[203] The court drew the line, requiring an algorithm for any function needing "special programming" or "more than merely plugging in a general-purpose computer."[204]

Judge Newman dissented, arguing that the court was now requiring more disclosure without specifying what more was needed.[205] She claimed that the

> adjusting means: microprocessors, discrete circuits connected to stepper motors, and analog circuits. (citations omitted).

Id. But see supra note 188 and accompanying text.

196. *Ergo Licensing*, 673 F.3d at 1363–64.

197. *Id.* at 1362–63.

198. *Id.* at 1363.

199. *Id.*

200. *Id.* at 1363–64.

201. *Id.* at 1364.

202. *Id.* at 1365 ("The 'control means' at issue in this case cannot be performed by a general-purpose computer without any special programming.").

203. *Id.* at 1364–65.

204. *Id.* at 1365.

205. *See id.* at 1369–70 (Newman, J., dissenting).

knowledge of a POSITA may be used to "flesh out"[206] a structural reference in the specification and that "precedent does not require a function to be implemented by a single structure."[207] She expressed her concern that "[t]he court's new position simply taints thousands of heretofore innocent patents, adding a further infusion of unreliability to the patent grant."[208]

2. Noah

As discussed, the point in the analysis when the court considers the knowledge of a POSITA is very important in the determination of claim scope. If the court looks to the knowledge of one skilled in the art at step one of the *Atmel* analysis,[209] to determine if the specification contains *some* structure, then the court may not look to outside knowledge beyond what is contained in the specification at this point.[210] Following *Medical Instrumentation & Diagnostics Corp. v. Elekta AB*, "[t]he correct inquiry is to look at the *disclosure* of the patent and determine if a POSITA would have understood that *disclosure*" to encompass structure linked to the claimed function.[211] Once that question is answered in the affirmative, the court may then look to the outside knowledge of a POSITA to identify what that structure is and flesh out the metes and bounds of the specific structure, as allowed in *Atmel* step two.[212] However, if the court does not allow the knowledge of a POSITA to be considered at step one, but instead determines whether the specification contains structure on its own, the court could potentially limit the scope of the patent by determining that the specification does not contain structure at all or by restricting construction to a specific structure.

206. *Id.* at 1371 (citing Creo Prods., Inc. v. Presstek, Inc., 305 F.3d 1337, 1347 (Fed. Cir. 2002)).

207. *Id.* at 1371 (citing Linear Tech. Corp. v. Impala Linear Corp., 379 F.3d 1311, 1322 (Fed. Cir. 2004)).

208. *Id.* at 1372.

209. *See* Atmel Corp. v. Info. Storage Devices, Inc., 198 F.3d 1374, 1381 (Fed. Cir. 1999).

210. Med. Instrumentation & Diagnostics Corp. v. Elekta AB, 344 F.3d 1205, 1212 (Fed Cir. 2003) ("It is not proper to look to the knowledge of one skilled in the art apart from and unconnected to the disclosure of the patent."); *Id.* (citing *Atmel*, 198 F.3d at 1382) ("It is important to determine whether one of skill in the art would understand the specification itself to disclose the structure, not simply whether that person would be capable of implementing that structure.").

211. *Id.*

212. *See Atmel*, at 1381; *see also* AllVoice Computing PLC v. Nuance Commc'ns, Inc., 504 F.3d 1236, 1245 (Fed Cir. 2007) ("[A]lgorithms in the specification need only disclose adequate defining structure to render the bounds of the claim understandable to one of ordinary skill in the art.").

This is the direction that the Federal Circuit took in *Noah Systems, Inc. v. Intuit Inc.*, where it announced the new rule that "where a disclosed algorithm supports some, but not all, of the functions associated with a means-plus-function limitation," the court should then treat the specification as if "no algorithm has been disclosed at all."[213] If no algorithm is disclosed at all, the court will not look to the outside knowledge of one skilled in the art.[214] To this extent, the court refused to allow Noah to introduce expert testimony regarding how a POSITA would view the sufficiency of the disclosure after holding that Noah's partial algorithm bore no structure at all.[215]

In *Noah*, the claim language at issue was "access means," and the parties agreed that the function was:

> providing access to the file of the financial accounting computer for the first entity and/or agents of the first entity so that the first entity and/or the agent can perform one or more of the activities selected from the group consisting of entering, deleting, reviewing, adjusting and processing the data inputs.[216]

The special master denied Noah the opportunity to present expert testimony about how one skilled in the art would view the specification, ruling that no algorithm was disclosed.[217] However, the Federal Circuit held that the district court was incorrect when it ruled that no algorithm had been disclosed, finding sufficient disclosure[218] that clearly linked structure to the function of "providing access to the file."[219] But, because the court construed

213. Noah Sys., Inc. v. Intuit Inc., 675 F.3d 1302, 1318 (Fed. Cir. 2012).

214. *Id.* at 1313 (citing Aristocrat Techs. Austl. Pty Ltd. v. Int'l Game Tech, 521 F.3d 1328, 1337 (Fed. Cir. 2008); *Atmel*, 198 F.3d at 1382). The court classified means-plus-function claims into two groups: "First, cases in which the specification discloses no algorithm; and second, cases in which the specification does disclose an algorithm but a defendant contends that disclosure is inadequate." *Id.* at 1313. The court explains:

> This distinction is important because we have clarified that, while "[i]t is certainly true that the sufficiency of the disclosure of algorithmic structure must be judged in light of what one of ordinary skill in the art would understand the disclosure to impart," in a situation in which the specification discloses no algorithm, "[t]hat principle . . . has no application . . . ."

Id. (quoting *Aristocrat*, 521 F.3d at 1337).

215. *Id.* at 1319.

216. *Id.* at 1307.

217. *Id.* at 1308.

218. *Id.* at 1313. The court explained the sufficient algorithm: "The specification clearly discloses that authorized agents are provided with passcodes and that agents cannot enter, delete, review, adjust or process data inputs within the master leger unless the passcode is verified." *Id.*

219. *Id.* at 1313–14.

the claim in question as having two distinct functions and held that any disclosed algorithm must address both functions,[220] the court declared that the disclosure was only a partial algorithm,[221] as it only described one of the two functions.[222] The court then categorized Noah's claim as having "no disclosed algorithm" under its new rule,[223] which precluded the court from considering evidence of what one skilled in the art would understand from the specification.[224] Thus, the court held the claim indefinite.[225]

The rule adopted by the court placed heightened disclosure requirements on computer-implemented functions. The Federal Circuit deviated from precedent in two distinct ways when deciding *Noah*, each raising the bar for what patentees must disclose in computer-implemented means-plus-function claims. First, it treated the disclosure of a partial algorithm as if it were no structure whatsoever.[226] Second, in doing so, it did not consider whether a POSITA would find *some* disclosed structure in the specification that was linked to the disclosed function.[227]

While the court was correct to hold that the knowledge of a POSITA cannot be used to flesh out a structure if no structure is disclosed at all, it was out of line with precedent to deny Noah the opportunity to present expert testimony showing that a POSITA would have interpreted the *disclosure* to contain *some* structure.[228] Instead, the Federal Circuit decided as a matter of law that an algorithm corresponding to only one of two claimed functions is

220. *Id.* at 1314 (citing Default Proof Credit Card Sys. Inc. v. Home Depot U.S.A., Inc., 412 F.3d 1291, 1298 (Fed. Cir. 2005)).

221. *Id.* at 1318.

222. *Id.* at 1313–14.

223. *Id.* at 1318.

224. *See id.* at 1318–19.

225. *Id.* at 1319.

226. *Id.* at 1318.

227. *Id.* at 1313.

228. *See* Finisar Corp. v. DirecTV Group, Inc., 523 F.3d 1323, 1340 (Fed. Cir. 2008) ("Thus the patent must disclose, at least to the satisfaction of one of ordinary skill in the art, enough of an algorithm to provide the necessary structure under § 112[f]."). *See also* Aristocrat Techs. v. Int'l Game Tech, 521 F.3d 1328, 1337–38 (Fed. Cir. 2008) ("[A] person of ordinary skill in the art would not recognize the patent as disclosing any algorithm at all."); Atmel Corp. v. Info. Storage Devices, Inc., 198 F.3d 1374, 1380 (Fed. Cir. 1999) ("However, interpretation of what is disclosed must be made in light of the knowledge of one skilled in the art."); Med. Instrumentation & Diagnostics Corp. V. Elekta AB, 344 F.3d 1205, 1212 (Fed. Cir. 2003) ("The correct inquiry is to look at the *disclosure* of the patent and determine if one of skill in the art would have understood that *disclosure* to encompass software for digital-to-digital conversion and been able to implement such a program.") ("It is important to determine whether one of skill in the art would understand the specification itself to disclose the structure . . . .").

no structure at all.[229] This precluded the court from getting to step two of the *Atmel* procedure. The court relied on *Biomedino, LLC v. Waters Technologies Corp.* in reasoning that allowing the "disclosure as to one function to fill the gaps in a specification as to a different, albeit related, function" would be condoning impermissible functional claiming.[230] Under *Noah*, a partial algorithm is no longer considered *some* structure, and the court may reach the conclusion of a partial algorithm without evidence of whether a POSITA would view a partial algorithm as a structure clearly linked to the claimed functions in light of the specification. Logically, this holding also implies that *some* (partial) structure is no structure, contrary to *Atmel*, which holds that if *some* structure is found, the court should look to the knowledge of a POSITA to identify that structure.[231]

Denying the introduction of expert testimony and allowing the court to determine on its own that the specification contains no structure gives the court broad discretion to determine whether an algorithm is partial or complete. To this extent, it allows the court to be stricter in deciding what constitutes *some* structure and to invalidate overly broad claims, but it does not put forward any specific parameters.

IV. CONCLUSION

Although the state of the law of computer-implemented functions is often highly complex and difficult to discern, it can be applied to invalidate overly broad claims and reduce impermissible functional claiming. As Professor Lemley has described, if this process is applied to software claims that are not written in means-plus-function format, but rather use impermissible functional language to obtain ownership over entire computer-implemented functions, many of the problems with software patents could be alleviated. The recent cases described in this Note take steps toward heightening the standards for construing corresponding structure from the disclosure in the specification. In order to serve the notice function of patents and to reign in the impermissible functional claiming that is responsible for many of the problems in the software industry, the Federal Circuit must continue to apply these rules with consistency and stop

229. *Noah*, 675 F.3d at 1318 (concluding that "where, as here, a claim recites multiple identifiable functions and the specification discloses an algorithm for only one, or less than all, of those functions, we must analyze the disclosures as we do when no algorithm is disclosed").

230. *Id.* at 1319 (citing Biomedino, LLC v. Waters Techs. Corp., 490 F.3d 946, 948 (Fed. Cir. 2007)).

231. *See Atmel*, 198 F.3d at 1381.

patentees from obtaining broad ownership rights over computer-implemented functions.