A Nonobvious Approach to Functional Claiming in Software Patents

Jennifer Chiang
American University Washington College of Law

Follow this and additional works at: https://digitalcommons.wcl.american.edu/ipbrief

Part of the Intellectual Property Law Commons, and the Science and Technology Law Commons

Recommended Citation
Available at: https://digitalcommons.wcl.american.edu/ipbrief/vol8/iss1/1

This Article is brought to you for free and open access by the Washington College of Law Journals & Law Reviews at Digital Commons @ American University Washington College of Law. It has been accepted for inclusion in Intellectual Property Brief by an authorized editor of Digital Commons @ American University Washington College of Law. For more information, please contact kclay@wcl.american.edu.
A Nonobvious Approach to Functional Claiming in Software Patents
A NONOBIous APPROACH TO FUNCTIONAL CLAIMING IN SOFTWARE PATENTS

Jennifer Chiang*

INTRODUCTION

I. Background on Means-Plus-Function Claiming Under § 112(f) ............... 7
   A. Why Functional Claiming is a Problem in Software ...................... 7
   B. Permissible Limited Functional Claiming Under § 112(f) ............... 10

II. Analysis of Lemley’s §112(f) Solution ............................................. 14
   A. Lemley’s Solution to Automatically Apply § 112(f) to Functional
      Software Claims........................................................................... 14
   B. Issues with Lemley’s Approach..................................................... 14

III. Addressing Overbroad Functional Claims Pre-Issuance Through
     Prosecution..................................................................................... 29
   A. Addressing Functional Claims Through the Nonobviousness Doctrine 30
   B. Revisiting § 112(f) In Prosecution............................................... 37

* The George Washington University Law School, J.D. 2016; University of California, San Diego, M.S. 2007, Computer Science; University of California, San Diego, B.S. 2005, Computer Engineering. I would like to thank Michael Abramowicz for his advice and guidance in writing this note.
IV. Addressing Overbroad Functional Claims Post-Issuance Through Markman Hearings

A. Reforming Markman Hearings to Include Nonobviousness Determinations

B. Revisiting § 112(f) to Weed Out Overbroad Patents Post-issuance

C. Reforms the Federal Circuit Must Consider to Effectively Use § 112(f) to Restrict Claims

CONCLUSION

APPENDIX I

A. Functional Claim

B. Functional Abstraction

C. Abstract Data Type

D. Pseudo Code

E. Data Structure

F. HTML Source Code

INTRODUCTION

Functional claiming has been the issue at the heart of the software patent problem. Functional claiming is particularly problematic in software patents as inventors may use them to broadly claim an entire goal instead of a particular implementation. The accumulation of such software patents has created a patent

1 See infra Part I.

2 Mark A. Lemley, Software Patents and the Return of Functional Claiming, 2013 Wis. L. Rev. 905, 907.
thicket, leading to their abuse by patent trolls, causing extended litigation, and making it difficult for patent examiners to search through prior art.\(^3\) Courts have failed to offer a solution to reign in functional claiming, having “assiduously avoided” the problematic software patent issue for over twenty-five years.\(^4\) The Supreme Court has indirectly addressed overbroad software patents by finding patents invalid for indefiniteness when the patent’s specification fails to provide the scope of the invention as in \textit{Nautilus} or for being abstract when process patents merely apply an abstract idea using a generic computer implementation as in \textit{Alice}.\(^5\) These decisions, while a step in the right direction, do not address the overall problem of functional claiming. The U.S. Patent and Trademark Office (PTO) has taken steps to provide expedited routes to enable third parties to

\(^3\) \textit{Id.}, at 920-928. The “patent thicket” as defined by Carl Shapiro and cited by Lemley is the result of a “complex overlapping of patent rights that simply involves too many rights to cut through.” Products such as smartphones utilize an estimated amount of 250,000 patents. This makes it not only expensive to innovate, but expensive to license. Additionally, technology companies must deal with endless litigation brought on by patent trolls who own such overbroad functional patents if they refuse to pay royalties. Companies also build up patent portfolios for defensive purposes, resulting in a patent “arms race.” This is expensive as companies have spent $15-20 billion buying patents.


\(^5\) See \textit{Nautilus, Inc. v. Biosig Instruments, Inc.}, 134 S. Ct. 2120, 2124 (2014) (holding that “a patent is invalid for indefiniteness if its claims, read in light of the patent’s specification delineating the patent and prosecution history, fail to inform, with reasonable certainty, those skilled in the art about the scope of the invention”); \textit{Alice Corp. v. CLS Bank International}, 134 S. Ct. 2347, 2352 (2014) (reinforcing the Mayo framework that “merely requiring generic computer implementation fails to transform [the] abstract idea into a patent-eligible invention”); see also \textit{Mayo Collaborative Servs. v. Prometheus Labs., Inc.}, 132 S. Ct. 1289, 1294, 1296-98 (2012) (providing a twostep test (Mayo test) to determine if there’s an “inventive concept” and an element or combination of elements that is sufficient to transform the process to significantly more than the abstract concept itself).
challenge patent validity through post grant proceedings and \textit{inter partes} review; however, these procedures do not reform functional claiming.\textsuperscript{6} In an effort to address this problem, Professor Lemley has suggested reforming functional claims by treating all functional software claims as means-plus-function claims.\textsuperscript{7} Under \$ 112(f), this limits all functional claim elements to only the implementations described in the specification.\textsuperscript{8}

While seemingly simple, using \$ 112(f) to reform functional claiming is in reality not so straightforward. Under \$ 112(f), only claims that contain the trigger words “means for” will automatically invoke means-plus-function claiming. Otherwise, claim interpretation is needed to construe a functional claim as a means-plus-function claim, which lends itself to subjectivity and controversy.\textsuperscript{9} To make matters worse, there is a rebuttable presumption against the use of \$ 112(f) if certain trigger words are not present. Coupled with the courts’ unwillingness to invoke \$ 112(f) absent the trigger word “means” or equivalent nonce words, this makes the statute a difficult one to apply.\textsuperscript{10} As a result, automatically invoking \$ 112(f) may actually increase litigation instead of curtailing it, making \$ 112(f) an imperfect mechanism for narrowing functional claims.

Given the difficulty in applying \$ 112(f), the nonobviousness doctrine may be a better approach for weeding out overbroad functional patents.\textsuperscript{11} Under \$ 103,
claims that cover broad functionality are likely to be found obvious. By applying a nonobviousness filter, both the PTO and courts can more efficiently weed out overbroad functional patents by focusing their attention on the merits of the invention and the scope of claims instead of getting bogged down in determining whether a claim meets the requisite structural elements of § 112(f) in order to then narrow the claim through the statute.

This paper presents two phases for effectively tackling functional claims using the nonobviousness doctrine. Pre-grant, the PTO may prevent new overbroad claims from being issued. Post grant, courts may invalidate or narrow functional claims through pretrial claim construction hearings in order to eliminate unnecessary litigation. In order to allow courts to invalidate claims pretrial, the Federal Circuit must reform its approach to allow courts to consider the inventive contribution during claim construction.

Currently, the Federal Circuit has separated findings of fact, such as the inventive contribution, from legal questions, such as claim construction. However, without allowing courts to consider the inventive contribution, courts will not be able to determine when to narrow claim scope. This initial step is necessary in order for claims to be narrowed. Courts may better utilize the nonobvious doctrine to invalidate claims pretrial once the Federal Circuit has

---

12 See infra Part III.A and Part IV.A.
14 See infra Part III.
15 See infra Part IV.
16 See infra Part IV.
allowed them to consider underlying facts of the invention. Similarly, in order for Lemley’s solution to work as intended, courts must first understand the inventive contribution in order to effectively apply § 112(f) to tackle overbroad software patent claims.

This paper considers methods for solving the functional claiming problem by first analyzing the applicability of Lemley’s solution and then providing an alternative solution using nonobviousness to weed out overbroad functional patents as early as possible both during prosecution and during litigation. Part I presents the background of functional claiming under § 112(f), the issues with functional claiming in software patents, and the controversial application of § 112(f) to claims not drafted in means-plus-function format. Part II analyzes Lemley’s proposed solution to automatically apply § 112(f) to all software functional claims and the benefits and drawbacks of his approach. Parts III and IV present an alternative approach using the nonobviousness doctrine in two phases to tackle functional claims. Part III discusses the first phase where the nonobviousness doctrine is applied during prosecution to prevent functional claims from being issued in the first place. The applicability of § 112(f) during prosecution to narrow claims is also discussed. Part IV discusses the second phase where the nonobviousness doctrine should be applied post grant during Markman hearings to retroactively invalidate functional claims prior to trial. This section discusses reforms the Federal Circuit must adopt in order to introduce nonobviousness to pretrial hearings. Part IV also discusses the reforms the Federal

18 See id.; *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 413-15 (2007) (indicating that because nonobviousness involves underlying questions of fact, it is therefore not considered by the Federal Circuit during claim construction which happens prior to trial).
Circuit must make in order to effectively employ § 112(f) as a viable solution to restrict claims during claim construction.

I. BACKGROUND ON MEANS-PLUS-FUNCTION CLAIMING UNDER § 112(F)

A. Why Functional Claiming is a Problem in Software

Functional claiming has been a hotly debated area in software patents because it allows entire genres of functionality being claimed instead of particular implementations to accomplish those functions.\textsuperscript{19} Lemley describes the problem as patentees claiming to own the goal itself instead of the specific way to achieve the goal.\textsuperscript{20} In software, such functional claims are prevalent.\textsuperscript{21} Because software is inherently functional, it is designed to solve an abstract problem by breaking down the problem into smaller, solvable functions.\textsuperscript{22} Inevitably, claims in software patents are thus functional in nature as they are written to protect the functional innovations that the software provides.\textsuperscript{23}

While the patent system grants limited monopolies to patentees “to promote

\textsuperscript{19} Lemley, \textit{supra} note 2, at 908.


\textsuperscript{21} Collins, \textit{supra} note 20, at 1444.


\textsuperscript{23} Collins, \textit{supra} note 20, at 1444 (Collins claims that the nature of software inventions being purely functional entities because there are “no relevant physical, structural properties to grab onto and require as claim limitations”).
the Progress of Science and useful Arts,” the Supreme Court has required patentees to define clear boundaries of what it is exactly that patentees own to the public.24 However, functional claiming has led patentees to claim broad boundaries for their inventions, despite having only described a few embodiments.25 This enables patentees to block all current and future market competition for a particular functionality, where any market substitute technology that performs the same function as the patentee’s would fall within the scope of the functional claim.26 From a social policy perspective, this is troubling because patents are not designed to confer market monopolies.27

One historic example of this is Morse’s broad functional claim covering all communications using electromagnetic means for printing characters at a distance.28 If Morse’s claim had been valid, every modern day means for communication through electromagnetic means, such as through the Internet, computers, fax, etc. would have infringed his patent, although these technologies had not yet been invented. Instead, Morse was appropriately awarded a narrower claim for his particular implementation of the telegraph which constituted the electromagnetic means for communication.29

25 Collins, supra note 20, at 1444-45.
26 Halliburton Oil Well Cementing Co. v. Walker, 329 U.S. 1, 12-13 (1946) (holding that substituting broad language at the point of novelty does not provide sufficient notice of what is being removed from the public domain).
27 Lemley, supra note 2, at 912.
28 O’Reilly v. Morse, 56 U.S. 62, 106 (1854).
29 Id. at 132.
One argument against the threat of Morse securing a genre of technologies with his broad claim is that his patent would have expired long before the invention of modern day technologies, such as the Internet. Under this argument, the dangers of broad software claims are mitigated by a limited patent term. However, it is unforeseeable how quickly technology may develop. Although Morse’s patent may have expired long before the Internet was invented, it may still have covered unanticipated, incremental innovations that were precursors to the Internet. It is arguable that the invention of the Internet might have been delayed had innovation been blocked by Morse’s overbroad patent. While going from telegraph to the Internet took over a century, in the modern era, software innovation has grown at a more accelerated pace. Particularly for software technology, a twenty-year patent term may be quite long and encompass much more innovation than Morse’s patent would have covered in the same time span. Rather than gamble on patent term expiration to weed out blocking patents, it is more practical to restrict functional claiming when possible to promote innovation.

30 Moore’s law is a general rule that the number of transistors in an integrated circuit doubles every two years. Moore's law describes a driving force of technological and social change, where the approximate exponential growth of transistors has been loosely linked to the growth of technology. Moore’s Law, WIKIPEDIA, https://en.wikipedia.org/wiki/Moore%27s_law (last visited Dec. 17, 2015).

31 See Robert Merges, Intellectual Property Rights and Bargaining Breakdown: The Case of Blocking Patents, 62 TENN. L. REV. 75, 80-81 (1994) (describing the blocking patent phenomenon where an inventor may leverage a broad patent to prevent others from building up his invention unless they take a license).
B. Permissible Limited Functional Claiming Under § 112(f)

As problematic as functional claiming may be, it is not prohibited. Limited functional claiming is permissible under the Patent Act of 1952, codified under 35 U.S.C § 112(f), which provides for means-plus-function claiming. § 112(f) allows patentees to claim functionality without disclosing structure in the claim, to the extent that such functional elements are limited to only the disclosed structures described in the specification and any equivalents. The statute § 112(f), states:

An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such a claim shall be construed to cover the corresponding structure, material or acts described in the specification and equivalents thereof.

For software functional patents, the statute restricts a functional claim to only the disclosed algorithm used to implement that function. Because an algorithm describes a specific set of steps for achieving the general function claimed, courts have considered algorithms to be the “metaphorical structure of a software

33 Id.
34 Id.
35 Aristocrat Techs. Austl. Pty Ltd. v. Int’l Game Tech., 521 F.3d 1328, 1333 (Fed. Cir. 2008). See Lemley, supra, note 1, at 946-47; Collins, supra note 20, at 1447 (Collins claims that courts have ported the invention-structure equation over to the software arts by “framing algorithms as the metaphorical structures of software inventions and adopting a technology-specific invention-algorithm equation”).
invention” used to limit the scope of functional claims.\textsuperscript{36} Thus, § 112(f) provides a mechanism to constrain functional claiming when invoked; however, outside the reach of § 112(f), functional claiming remains unrestricted and problematic.

The problem with § 112(f) is that it is an opt-in statute.\textsuperscript{37} The Federal Circuit has held that §112(f) applies “only to purely functional claims that do not provide the corresponding structure that performs the recited function.”\textsuperscript{38} Without the use of “means for” or equivalent nonce words, there is a rebuttable presumption against §112(f).\textsuperscript{39} Patentees avoid §112(f) by showing that the element in question is not functional or that the element is sufficiently described by structure to avoid invoking the statute.\textsuperscript{40} Because of this presumption, functional claiming is particularly problematic in software patents, as patentees have intentionally circumvented § 112(f) by cleverly associating functional elements with trivial computer hardware to provide structure.\textsuperscript{41} The following exemplary claim illustrates this:

A method for unlocking a device using a touch screen comprising: touching the screen along several points on the screen to indicate a gesture, wherein the gesture matches the gesture previously stored in the

\textsuperscript{36} Collins, \textit{supra} note 20, at 1447.

\textsuperscript{37} \textit{Lighting World}, 382 F.3d, 1354, 1359 (Fed. Cir. 2004) (holding that if the term “means for” is used, there is a presumption that section 112(f) applies, but the presumption is rebuttable if sufficient structural limitations are specified).

\textsuperscript{38} \textit{Phillips v. AWH Corp.}, 415 F.3d 1303, 1311 (Fed. Cir. 2005) (en banc).

\textsuperscript{39} \textit{Lighting World}, 382 F.3d, at 1359-60.

\textsuperscript{40} Id.

\textsuperscript{41} Lemley, \textit{supra} note 2, at 949-950.
device as a password.

Here, a device is unlocked using a touch screen, but provides no indication of how the unlocking is performed. Tying the method to a touch screen is insufficient. Since software is designed to run on all types of hardware platforms, referencing general-purpose computers and computer components to provide structure does not contribute anything to the functionality of the claim. Thus, patentees may cleverly bypass the limits of §112(f) by simply referencing components of a computer as structure in the claim to obtain broad functional claims without restriction to particular implementations.

The following exemplary claims from issued patents further illustrate how clever patent drafting by tying the claim to generic computer components sidesteps §112(f):

“Computer readable program code configured to cause a computer to [perform series of steps].”

“A method for locating online information comprising the steps of [various steps not employing any hardware].”

“Software executing in the central processor to configure the processor so as to [perform a series of functions].”

In each of the above claims, the referenced structure consists either of trivial

---

42 Id. at 919.
43 Id. at 945-946.
44 U.S. Patent No. 5,878,400 col.23 ll.22-23 (filed June 17, 1996) (emphasis added).
hardware structure such as “computer” or “processor” or do not reference any hardware at all. Furthermore, the nominal hardware structure not only avoids the scope limitations of § 112(f), but also obscures the fact that the software algorithm used to implement the functionality is missing. As a result, each claim is purely functional in describing the set of functions with no implementation details disclosed in the claim language.

Recently, courts have started to apply § 112(f) more broadly by interpreting a claim element as a means-plus-function element despite the lack of the trigger word “means,” if the element does not provide sufficiently definite structure. However, arbitrary judicial subjectivity in claim interpretation and the lack of a standard for defining a functional element have led to courts to apply § 112(f) to software claims inconsistently. This controversial approach has led to increased litigation when the presumption to invoke § 112(f) is rebutted, morphing § 112(f) “from a clear legal instruction into a litigator’s delight.” Despite these complexities, Lemley’s solution takes this approach a step further by automatically applying § 112(f) to all functional software claims.

47 Lemley, supra note 2, at 923.
48 Id. at 930. See also Morse, 56 U.S. at 112.
49 Williamson, 792 F.3d at 1348.
50 Id. at 1362-3.
51 Id. (holding that there is a rebuttable presumption that § 112(f) is not applied if the claim that does not use the “means for” term, but if structural limitations are not specified to describe the means, the presumption may be rebutted). See also Apple, Inc. v. Motorola, Inc., 757 F.3d 1286, 1297 (Fed. Cir. 2014).
52 See infra Part II.
II. **ANALYSIS OF LEMLEY’S §112(F) SOLUTION**

A. *Lemley’s Solution to Automatically Apply § 112(f) to Functional Software Claims*

To address the software patent problem, Lemley advocates that “we must take seriously the dictate of §112(f)” and treat all functional software claims as means-plus-function claims under §112(f). By automatically imposing § 112(f) on such claims, Lemley pushes the court to adopt a broader application of § 112(f). Under this approach, Lemley penalizes patentees, who try to achieve overbroad claims, by automatically reading in the limitations of specification and equivalents thereof into the claims to restrict each functional element. Lemley claims that this will leave the market open to allow later entrants to develop different algorithms that may achieve the same goal. This approach is attractive, according to Lemley, because no statutory modification is necessary, and courts may retroactively apply the means-plus-function doctrine in order to address the software patent thicket.

B. **Issues with Lemley’s Approach**

Although Lemley’s proposal has become quite popular because of its seemingly straightforward approach, Lemley has not fully explored the difficulties that arise in the automatic application of §112(f) to functional software claims. Lemley acknowledges that for § 112(f) to be effective, “courts must resist

---

54 *Id.*
55 *Id.* at 955-956.
56 *Id.* at 948.
the temptation to permit broad generic recitations of structure in a means-plus-function claim.”\textsuperscript{57} However, he does not provide any guidance for determining when a claim should be considered a means-plus-function claim. This makes his solution difficult to apply.

Lemley’s approach is premised on identifying claims containing \textit{functional elements that lack corresponding structure}.\textsuperscript{58} Thus to invoke § 112(f), functional elements that do not specify structure must first be identified in the claim. Second, the structure to implement the functional element must be missing or insufficient. Claim interpretation at each of these two steps introduces controversy because the standard for what constitutes a functional element and what is deemed sufficient structure is unclear.\textsuperscript{59} While Lemley recognizes that “courts and lawyers will doubtless disagree over . . . what structure corresponds to any other functional patent claim element” and “the level of in which the implementation should be disclosed,” he dismisses the issue as a general problem of patent scope.\textsuperscript{60}

\textit{i. Subjective Claim Interpretation Causes the Application of § 112(f) to be Inconsistent}

In order to utilize the statute, functional elements and acceptable structure must be properly defined. Courts have struggled to determine what constitutes a functional element and when computer elements are devoid of structure.\textsuperscript{61} As a

\textsuperscript{57} Id. at 951.

\textsuperscript{58} Id.

\textsuperscript{59} Williamson v. Citrix Online LLC, 792 F.3d 1339, 1351-52 (Fed. Cir. 2015).


\textsuperscript{61} See Williamson, 792 F.3d at 1348-49.
result, courts have applied § 112(f) inconsistently and have presumed that § 112(f) does not apply when the patentee has not opted into means-plus-function claiming.62

The applicability of § 112(f) without the word “means” in the claim is dependent on the use of functional elements comprising unmodified nonce words, such as “module,” “device,” “mechanism,” and “element,” to trigger §112 (f).63 The Federal Circuit held in Williamson that generic computer elements, such as “module”, “mechanism”, “element”, “device” and other “nonce words,” “reflect nothing more than verbal constructs” and should invoke §112(f) because they do not connote sufficiently definite structure.64 However, despite this guidance, the Federal Circuit has been unable to provide a consistent standard for what constitutes a “nonce word.” The Federal Circuit has inconsistently found claim structure described as "a computer" or "a processor" or even "the Internet" to be sufficient and allowed the broadly claimed function without triggering § 112(f).65

62 Kevin Emerson Collins, Patent Law’s Functionality Malfunction and the Problem of Overbroad, Functional Software Patents, 90 WASH. U. L. REV. 1399, 1463 (2013) (stating that when a patentee does not use a means-plus-function claim, “courts often find sufficient structure in claim limitations to preclude the application of section 112(f) even when the claim is in effect a purely functional claim”); see also Flo Healthcare Sols., LLC v. Kappos et al, 697 F.3d 1367, 1374-75 (Fed. Cir. 2012) (holding that it is up to the patentee to indicate if she has elected to invoke § 112(f)).

63 Williamson, 792 F.3d at 1355-58 (Reyna, J., concurring in part, dissenting in part) (recognizing that the determination of whether nonce words trigger § 112(f) has caused arbitrary judicial subjectivity and further pushed the issue into claim construction).

64 Id. at 1350 (quoting Mass. Inst. of Tech. & Elecs. for Imaging, Inc. v. Abacus Software, 462 F.3d 1344, 1354 (Fed. Cir. 2006); see generally MPEP § 2181 (2015).

65 See Apple, Inc. v. Motorola, Inc., 757 F.3d 1286, 1296-97 (Fed. Cir. 2014) (where “processor” is not a generic nonstructural term such as “element”, and “device” that typically do not connote sufficient structure); Inventio AG v. ThyssenKrupp Elevator Ams. Corp., 649
Outside the reach of § 112(f), the fundamental rule of patent claim construction requires that claim terms are to encompass all general meanings of the term.66 Limitations, preferred embodiments, and specific examples from the written description are not to be read into the claims.67 Thus, until the courts determine how to consistently identify functional software claims, claims drafted in this ambiguous manner will continue to percolate into the world.

In the aftermath of Williamson, the court seems to still be forgiving of borderline functional language (i.e., when “means” is not used but when modified nonce words are used instead).68 To further complicate things, the Federal Circuit

F.3d 1350, 1359-60 (Fed. Cir. 2011) (where "computing unit" was sufficiently definite structure that did not invoke § 112(f)); Lighting World, Inc. v. Birchwood Lighting , Inc., 382 F.3d, 1354, 1360 (Fed. Cir. 2004) (where a term covering a broad class of structures and identifies structures by their function is sufficient to avoid invoking § 112 (f)); In re Alappat, 33 F.3d 1526, 1545 (Fed. Cir. 1994) (en banc) (holding a general-purpose computer was a new machine whenever it was programmed with new instructions which opened the door to treating a programmed computer as physical structure rather than invoking § 112(f)). However, the Patent Trial and Appeal Board has also found in some instances that claims that only included a “processor” as structure invoked § 112(f)); see also Ex parte Smith, No. 2012-00763, slip op. at 3 (PTAB Mar. 14, 2013) (“processor programmed to”); Ex parte Lakkala, No. 2011-001526, slip op. at 4 (PTAB Mar. 13, 2013) (“processor . . . configured to”); Ex parte Errol, No. 2011-001143, slip op. at 9 (PTAB Mar. 13, 2013) (“processor adapted to”).


67 Teleflex, 299 F.3d at 1328; SciMed Life Sys., 242 F.3d at 1340-41.

68 Kappos and Davis, Functional Claiming and the Patent Balance, 18 STAN. TECH. L. REV. 365, 371-72 (2015) (explaining that the Williamson court deemphasized the reliance on nonce words to interpret a claim as means-plus-function in the absence of “means.” Kappos points out that dicta in Williamson suggests even naked nonce words may avoid § 112(f) if the right definition can be found in a dictionary. Modified nonce words are nonce words with
held in *Apple* that “even if a patentee elects to use a generic claim term, such as a nonce word or a verbal construct, properly construing that term (in view of the specification, prosecution history, etc.) may still provide sufficient structure such that the presumption against means-plus-function claiming remains intact.”69 Due to the complexities of technology, Professor Chien warns that the “application of [§ 112(f)] in every context may be over inclusive because the boundary between functional and nonfunctional language is heavily dependent on the technology involved.”70

The determination of whether a claim contains functional language is also dependent on “whether a skilled artisan would conclude, after reading the specification, that a claim limitation is “so devoid of structure” that the drafter engaged in means-plus-function claiming.”71 The *Apple* court determined that a person of ordinary skill in the art (POSITA) working in the software arts would understand that “processor” is a sufficiently definite structure comprising a microprocessor with sufficient circuitry to perform the described functions, and thus did not invoke § 112(f).72 Structure, the court held, may also be provided by “describing the claim limitation’s operation such as its input, output or preceding descriptors, such as “distributed learning control module,” where “distributed learning control” modify the nonce word “module”)

69 *Apple, 757 F.3d at 1299.*


72 *Apple, Inc. v. Motorola, Inc., 757 F.3d 1286, 1297-1300 (Fed. Cir. 2014).*
connections.”

In contrast, the Bosch court found that the claim terms “program recognition device” and “program loading device” did not provide any structural guidance because they merely identified functions to be performed by the device, and thus triggered §112(f). The subjectivity involved in determining when a claim term provides sufficient structure makes it difficult to determine when a claim is a means-plus-function claim. Thus, depending on claim construction, §112(f) may not be applicable if sufficient structure is found in otherwise what would appear to be a functional claim.

ii. The Standard for Sufficient Disclosure of Structure is Ambiguous

Lemley’s solution also does not take into consideration that the requirement for structure is not well defined. Lemley uses the Federal Circuit’s current approach of requiring disclosure of an algorithm for §112(f) claims as his strategy to limit the breadth of software claims; however, the algorithm requirement is unlikely to have any real limiting effect without guidelines for what needs to be disclosed. Disclosure of algorithm in prose or high-level flow charts that only describe a “high level process flow” may not disclose structure to the degree of specificity required to define the boundaries of the software

73 Id. at 1299.
75 Aristocrat Techs. Austl. Pty Ltd. v. Int’l Game Tech., 521 F.3d 1328, 1333, 1338 (Fed. Cir. 2008) (holding that when a claimed function is performed by software, an algorithm is a critical component of the relevant structure and recitation of a general purpose computer or software alone is insufficient).
invention. For an algorithm to provide sufficient boundaries, the disclosed algorithm must explain how to implement the recited function in enough detail to allow a POSITA to take the actions necessary to implement the solution. An algorithm that fails to satisfy this requirement does little more than restate general functionality.

(a) **Determining Layers of Abstraction**

Because of the many layers of software abstraction, boundaries for describing an algorithm are difficult to define. In her study of functional patents, Chien utilized the programming paradigm of five levels of software abstraction to determine whether support for functional claims was sufficiently provided. She concluded that while § 112(f) is helpful for weeding out unsupported functional claims, “greater clarity through court decisions would be needed to determine the scope of “supported” functional claims.”

The five levels of software abstraction include: functional abstraction, abstract data types, pseudo code, data structures, and source code. At the highest level,

---

76 See id. at 1334 (holding that a disclosure that simply describes a function to be performed or an outcome lacks the necessary structure).

77 *AllVoice Computing PLC v. Nuance Commc’ns, Inc.*, 504 F.3d 1236, 1245 (Fed. Cir. 2007).

78 Id. at 1245-46

79 Chien, *supra* note 70, at 41.

80 Id. at 6.

81 Id. at 13.

82 Id. at 6.
functional abstraction defines only the end goal to be achieved without the how.\footnote{83}{Id.} For example, a functional abstraction for providing directions would be “getting from point A to point B.” This functional level of abstraction, Lemley notes, is the most troubling for software patents.\footnote{84}{Chien, supra note 70, at 7.} Disclosure at the functional abstraction level is insufficient because it merely describes the goal without explaining how. This is typically the problematic type of structure disclosed by functional software patents.\footnote{85}{Id.}

The next two layers, abstract data types and pseudo code levels of abstraction, describe software independently of any computing infrastructure.\footnote{86}{Id.} Abstract data types describe software in various building blocks that are needed to carry out a particular function. Abstract data types for the example above may include “walking,” “driving,” and “metro,” where different directions for each mode of transportation may be computed. Pseudo code incorporates a general approach to how to implement the function using words to describe a collection of operations to be implemented in source code.

An example of pseudo code may include: (1) determine final destination, (2) determine starting point, (3) determine mode of transportation, and (4) generate directions based on steps 1-3. Disclosure at the pseudo code level using abstract data types is the most helpful because steps for how to perform a function are disclosed at a high enough level for a POSITA to understand. Because it is a narrative, no special knowledge is required as the description is not tied to any
specific computing platform. This level of abstraction should be the minimum level of abstraction used for software disclosure. Unfortunately, it is just as difficult to define a standard for the amount of detail pseudo code and abstract data types should provide. In the directions pseudo code example discussed above, the four steps do not provide enough information about how exactly directions are computed. A patentee trying to evade disclosure may point to flow charts that suffer from the same deficiency. Hence, pseudo code that is too ambiguous does not provide sufficient disclosure.

The last two levels of software abstraction are data structures and source code, which are used to implement the function for a specific computing infrastructure. Data structures are programming constructs used to implement abstract data types and functions, such as linked lists, binary trees, and arrays. Source code entails the specific computer code written to implement the function, which is typically written in a computer language such as C++, or Java. While these levels of detail are typically too detailed and require a particular level of expertise to understand, this level of abstraction has been recommended as the only sufficient level of abstraction where a patentee cannot evade implementation details.

Because source code provides the actual step-by-step instructions to implement a function, it will necessarily provide implementation details. While, source code seems to be an appropriate level of abstraction, it may be too overbearing to provide any useful information. It seems the best level of abstraction would be an adequate level of higher level pseudo code disclosure

---

87 Id. at 8.
with supplemental source code snippets to provide implementation details to explain the inventive contribution.

U.S. Patent No. 5,930,474 is an example of disclosure provided at every level of abstraction. The claim is directed to organizing and delivering information such as business services, entertainment, news, and consumer goods to a user based on a specified location. In this example, disclosure at the lowest level of abstraction, source code, does not provide any helpful insight into the implementation. The specification describes the technology at a functional abstract level, describing the goal of providing results relevant to a user based on location. It also provides abstract data types as databases organizing information and pseudo code for search subroutines in narrative form. Additionally, data structures with HTML source code are disclosed. As shown in Appendix I, the narrative pseudo code provides the most helpful layer of abstraction in describing how the function was implemented at a high level in text.

In contrast, the data structures and HTML source code are unhelpful as the code is not only too specific and unreadable as a block of code, but also does not provide meaningful clues to the overall implementation. The appropriate level of abstraction must be one where a POSITA can understand the implementation without exerting excessive effort. Source code may be too low level to be

88 Id. at 11 (Chien uses this patent as the ideal example of proper disclosure at every level of software abstraction).

89 Id. at 11, citing U.S. Patent No. 5,930,474 col. 7. 5-29 (filed Jan. 3, 1996)

90 Appendix I.B.

91 Appendix I.C.

92 Appendix I.D.
practical.

(b) The Problem with Source Code

The struggle to provide guidelines for an appropriate level of disclosure remains unresolved. Advocates of Lemley’s solution support the adoption of source code as the preferred form of structure for disclosing an algorithm. In contrast, technology companies in the software industry have pushed back against this requirement, recognizing that this level of detail is unnecessary and requires a certain level of expertise to understand the programming language, paradigms, and complexities of the code.

Because source code is considered to be the blueprints of software, it is understandable that one who is not a POSITA would assume that a line-by-line inspection of the instructions would reveal the algorithm used to implement the

---


However, as seen in the example above, source code may in actuality be less helpful than pseudo code. Chien confirmed in her study that detailed source code over high-level disclosure of code elements do not necessarily promote technical progress.

From a prosecution perspective, given the limited time an examiner has to review a patent application, it is unreasonable to expect an examiner to dig through code to determine whether disclosure of the algorithm is sufficient. To further complicate things, an algorithm may be implemented through a series of functions that call many other layers of functions. Source code may also be optimized and may incorporate prior art technologies. Because of all these factors, source code is often difficult to understand and interpret without specialized expertise and guidance from an inventor.

As an example, code that implements encryption algorithms or codecs for encoding audio and video may involve complex mathematical equations that integrate algorithms in the prior art. Separating the inventor’s contribution from

95 Id.
96 Fonar Corp. v. Gen. Elec. Co., 107 F.3d 1543, 1548-49 (Fed. Cir. 1997) (quoting an expert witness testifying that source code would not be helpful because it is too machine specific)(“What’s much more important is to have a description of what the software has to do.”).
97 Chien, supra note 70, at 12.
99 Collins, supra note 62, at 1405-06.
100 Thomas, supra note 93, at 235.
101 Id.
prior art may also be a difficult and tedious task, as standard libraries are often used. Requiring source code examination may create excessive overhead and cause additional delay to the already slow patent examination process.

Construing equivalent software functions is another area that is especially tricky. It is difficult to determine equivalents of source code because not all code is created equal. Two pieces of code that implement the same function may look completely different, whereas code that looks similar may perform completely different functions.\textsuperscript{102} Additionally, equivalent code may be written in different languages, use different programming paradigms and constructs to implement a particular function.\textsuperscript{103} Limiting functional claims to the four corners of source code may not solve the problem. The lack of an established metric for comparing algorithms requires examiners and judges to make difficult discretionary judgments.\textsuperscript{104}

In light of these issues, perhaps the emphasis should not be on requiring disclosure at a particular level of abstraction. Instead, the focus should be disclosure at whatever level of abstraction that is necessary to enable a POSITA to implement the solution. If the POSITA understands how to implement each functional element from the disclosure, then the disclosure for that component is sufficient. It may also be easier to determine equivalents based on the similarity of the pseudo code steps used to implement the function rather than comparing the equivalence of two pieces of code.

\textsuperscript{102} Id. at 234-236; Ben Klemens, Math You Can’t Use: Patents, Copyright and Software 43 (2006).

\textsuperscript{103} Thomas, supra note 93, at 236.

\textsuperscript{104} Id.
iii. §112(f) Over Restricts Claims

Another problem with the automatic application of § 112(f) is that it may unnecessarily narrow claims. The Federal Circuit has generally not applied § 112(f) when a claim limitation contains a term that is “used in common parlance or by persons of skill in the pertinent art to designate structure.”105 Thus, under the fundamental patent canon of interpretation, a claimed invention should not be limited by preferred embodiments or specific examples in the specification when the claim is not a means-plus-function claim.106 By automatically applying § 112(f) to all functional software claims, Lemley violates the canon by imposing an over restrictive standard that bars an inventor from claiming his full invention.

Lemley’s solution punishes all functional software claims equally by restricting the claim to the structures disclosed by the specification without first evaluating the significance of the invention.107 This is in conflict with the Supreme Court’s doctrine that it is a “cardinal sin” of patent law to read the limitations of the specification into the claim by construing claim elements outside of the concept of the inventive contribution.108 In claim construction, a court should first determine what the real merit of the alleged discovery or invention is and whether it has advanced the art substantially.109 In light of the inventive contribution, the court should be liberal in its construction of the patent to give the inventor the reward he deserves if the patent provides a substantial

106 Teleflex, Inc. v. Ficosa N. Am. Corp., 299 F.3d at 1328.
107 Lemley, supra note 2, at 957.
contribution, but a narrower scope if the contribution is only a small step.\footnote{110}{Wright Co. v. Herring-Curtiss Co., 211 F. 654, 655 (2d Cir. 1914) ( awarding broader claim scope for wing warping because of the pioneering nature of the invention).}

Lemley, however, would rather over restricting the rare pioneering patent than risk harming society by allowing a patent that’s too broad.\footnote{111}{Lemley, supra note 2, at 952.} Lemley’s approach treats all software inventions as incremental contributions.\footnote{112}{Id. at 960. Incremental contributions are contributions that add only small improvements to existing inventions, compared to pioneering contributions, which are revolutionary in changing technology. For example, Wright’s flying machine is a pioneering contribution that received broad scope because of the advancement the contribution provided in flying. In contrast, an incremental contribution could be a particular wing design to make the plane more aerodynamic.} He argues that inventors should be “forbidden from substituting broad functional language for an actual implementation of the invention,” and that “distinguishing between programs that perform the same function in a different way is precisely what patent law is supposed to do.”\footnote{113}{Id. at 958-60.} Even if the inventive contribution is the discovery of a new function itself, Lemley insists that software patents should still be limited to the implementation the patentee developed.\footnote{114}{Id. at 961.} Although Lemley recognizes that software inventors could still claim a genus if the claims are limited to the actual technology developed and defined at the appropriate level of abstraction, his failure to provide a standard to define an appropriate level of abstraction makes this possibility a rare exception.\footnote{115}{Id. at 956. See also Chien, supra note 70, at 5 (analyzing various levels of abstraction in which to break down software in order to determine what structure would be sufficient to}
From the inventor’s perspective forcing all software functional patents to be subject to the requirements of § 112(f) may end up disincentivizing inventors from seeking patent protection. Instead, inventors may choose to keep their inventions private as trade secrets. Because means-plus-function claiming significantly narrows claims, it also has the disadvantage of being easy to work around, through step rearrangement or de minimis changes.\textsuperscript{116} For these reasons, patentees generally avoid means-plus-function claiming.\textsuperscript{117} Invoking means-plus-function claiming may not only thwart the patentee from getting the full protection the invention deserves, but also may harm society as trade secrets prevent the disclosure of information to the public.

\section*{III. Addressing Overbroad Functional Claims Pre-Issuance Through Prosecution}

Overbroad functional patents that are sifted out from the beginning will not be able to cause further harm down the road. Thus, if we want to prevent the growth of future problematic patents, we should preemptively invalidate them during prosecution. Addressing broad claims pre-issuance through prosecution offers two benefits. First, because granted patents are presumed to be valid, addressing the problem early on will be less expensive and less difficult to overcome than if such patents were addressed post grant.\textsuperscript{118} Additionally, problematic claims that are

\begin{footnotesize}
\begin{enumerate}
\item[116] Lemley, \textit{supra} note 2, at 918.
\item[117] \textit{Id}.
\item[118] Microsoft Corp. \textit{v. i4i LP}, 131 S. Ct. 2238 (2011) (establishing that issued patents have a strong presumption of validity).
\end{enumerate}
\end{footnotesize}
detected pre-issuance may be corrected by giving the patentee a chance to amend such claims to its proper scope.\textsuperscript{119} Second, addressing broad claims during prosecution gives the patentee the chance to clarify the meaning of ambiguous claim elements and required structures, instead of the court doing so retroactively. The prosecution history not only clarifies the significance and scope of the invention as well as ambiguous claim terms but also provides the groundwork for future claim construction and the determination of equivalents.\textsuperscript{120}

A. Addressing Functional Claims Through the Nonobviousness Doctrine

During prosecution, functional claims that are overbroad will be invalidated for being obvious.\textsuperscript{121} This aligns with Lemley’s goal to prevent the patentee from “substituting broad functional language for an actual implementation of the invention” at the point of novelty without introducing claim construction complexities associated with invoking \textsection{112}(f).\textsuperscript{122} Accordingly, the nonobviousness doctrine is a better approach as it focuses the analysis to the scope of the invention.

\textsuperscript{119} Halliburton Energy Servs., Inc. v. M-I LLC, 514 F.3d 1244, 1255 (Fed. Cir. 2008) (holding that “the patent drafter is in the best position to resolve the ambiguity in the patent claims, and it is highly desirable that patent examiners demand that applicants do so in appropriate circumstances so that the patent can be amended during prosecution rather than attempting to resolve the ambiguity in litigation).

\textsuperscript{120} See Pharmacia & Upjohn Co. v. Mylan Pharms., Inc., 170 F.3d 1373, 1376 (Fed. Cir. 1999) (explaining that "prosecution history estoppel precludes a patentee from obtaining under the doctrine of equivalents coverage of subject matter that has been relinquished during the prosecution of its patent application").

\textsuperscript{121} 35 U.S.C \textsection{103} (2011).

\textsuperscript{122} Lemley, \textit{supra} note 2, at 959.
Under the nonobviousness doctrine, an invention is obvious when the differences between the invention and the prior art are “such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.”123 The nonobviousness doctrine was established to allow patents only for “those inventions which would not be disclosed or devised but for the inducement of a patent.”124 This inducement standard not only helps to “promote the progress of the sciences and useful arts,” but also prevents the proliferation of economically insignificant patents that not only contribute to the patent thicket, but also are expensive to license.125 Because the nonobviousness doctrine weeds out trivial improvements from the prior art, nonobvious inventions are the actual inventive contributions that warrant patent protection.126 The nonobviousness doctrine effectively serves as a gatekeeper, filtering out broad claims without creating special rules for the category of software patents.

i. The Standard for Determining Nonobviousness

In order to determine nonobviousness, the scope and content of the prior art, the differences between the claimed invention and the prior art, the level of ordinary skill in the art, and secondary considerations are considered from the perspective of the POSITA for being obvious.127 Secondary considerations such

125 Lemley, supra note 2, at 920-928.
as commercial success, long-felt needs for the invention, the failure of others to create the invention, unexpected results, efforts by others to copy the invention, and licensing the invention, are additional considerations that weight towards the invention being nonobvious.\textsuperscript{128} On the other hand, simultaneous invention also points towards the invention being obvious.\textsuperscript{129} Today emphasis is placed on secondary considerations to determine obviousness.\textsuperscript{130}

Historically, the nonobviousness doctrine was a difficult doctrine to apply prior to KSR because a finding of obviousness depended on a teaching, suggestion or motivation (the TSM test) to combine prior art.\textsuperscript{131} Since a teaching, suggestion or motivation was rarely explicitly disclosed in the prior art itself, the nature of the problem, or the knowledge of a POSITA, obviousness was seldom used to invalidate claims.\textsuperscript{132} However, post KSR, the TSM test is no longer a required to invoke the obviousness doctrine.\textsuperscript{133} Other factors such as a particular combination being “obvious to try” or the creative steps and assumptions that a POSITA would consider are now sufficient for a finding of obviousness.\textsuperscript{134} As a result, nonobviousness has become more applicable and should be used more

\textsuperscript{128} Id. \textit{See also} Brown \& Williamson Tobacco Co. v. Philip Morris Inc., 229 F.3d 1120, 1129 (Fed. Cir. 2000) (listing secondary factors for determining nonobviousness).

\textsuperscript{129} Id.


\textsuperscript{131} KSR \textit{Int’l Co.}, 550 U.S. at 413-15.

\textsuperscript{132} Id.

\textsuperscript{133} Id.

\textsuperscript{134} Id.
rigorously to weed out functional claims that are so broad that they become obvious.

**ii. The Importance of the Inventive Contribution for Determining Claim Scope**

The nonobviousness doctrine ensures that even if an invention meets the novelty and utility requirements, it may not be deserving of a patent if it is merely a trivial improvement to the prior art. The nonobviousness doctrine measures the “technical accomplishment” of the inventor’s contribution to determine whether the development is significant enough over the prior art to deserve patentability. If the inventive contribution is found to be nontrivial, the scope given to a claim should be proportionate with the magnitude of the contribution. A claim should receive broad scope if the inventive contribution is pioneering and narrow scope if the inventive contribution is merely an improvement. The determination of the inventor’s contribution not only helps to restrict the scope of the claims, but also defines the boundaries of what the inventor recognized as his actual invention at the time of filing.

For example, a claim that covers unlocking a device using any gesture (e.g., a swipe) would be obvious without further limitations. However, if the inventive contribution was a particular type of gesture such as a “force press,” where the

---

135 *Id.*

136 *Id.; see also* 35 U.S.C § 102 (2011); 35 U.S.C. § 112(a) (2012).


device is able to determine different pressures of pressing, then the claim may only pass nonobviousness if it is limited to that restriction. Under the nonobvious doctrine, the claim for any type of gesture used as a password would be found obvious and hence invalid. Understanding the contribution of the invention upfront during prosecution will provide a roadmap for determining claim construction in future litigation and prevent patentees from stretching their claims to cover equivalents that are outside the scope of their inventions.

iii. Criticisms of the Nonobviousness Doctrine

(a) Using Experts to Facilitate the Discovery of Prior Art

One of the criticisms of the nonobviousness doctrine is the difficulty in finding relevant prior art references to render an invention obvious. One option for mitigating this is to develop a forum of experts for various subject matters whom examiners may then consult to find relevant prior art. Crowdsourcing has also been used to bring together diverse groups to broaden the consideration of prior art. Several such solutions exist today to help supplement prior art searching. Web-based organizations such as Software Patent Institute have aggregated prior art for certain fields of software that were not available electronically. Additionally, Article One Partners, provides a prior art search service through its online community. The USPTO has provided a fast track

---

139 Simon, supra note 130 at 373.
140 Id.
examination that utilizes an open review process where prior art received from an online public community is used to assess patent applications. Thus, better prior art searching should help examiners utilize nonobviousness to reduce the number of functional patents that are ultimately granted.

(b) Overcoming the Subjectivity of Nonobviousness

Like § 112, the nonobviousness doctrine is a standard that critics have held is dependent on subjective interpretation. However, such subjectivity is also problematic in other doctrines for determining patentability, such as enablement, utility, patentable subject matter, and means-plus-function claiming. It is important to focus, instead, on establishing guidelines to help standardize the application of doctrines with subjectivity concerns in order to provide consistency. While recent case law has offered some guidance for determining level of skill of a POSITA, there may be some subjectivity in determining the level of skill of a POSITA.

---


144 Simon, supra note 130, 354-55; Abbott Labs v. Sandoz, Inc., 544 F.3d 1341, 1352 (Fed. Cir. 2008) (noting that a finding of obviousness is highly dependent on context “including the characteristics of the science of technology, its state of advance, the nature of the known choices, the specificity or generality of the prior art, and the predictability of results in the area of interest”).


During prosecution, however, this is less of a problem as the patentee is a practitioner in the field and may confirm what a POSITA would know. Patent examiners may further consult experts to determine whether a POSITA would find an invention obvious. The examiner is also expected to have a certain level of knowledge and expertise in the particular technological area of a given invention in order to assess whether two inventions are similar. This base level knowledge that both the examiner and patentee must possess provides a safeguard against frivolous findings of obviousness.

Lastly, the patentee’s ability to rebut the examiner’s finding of obviousness during prosecution provides a safeguard for unreasonable subjective interpretation. Patentees may rebut § 103 obviousness rejections by showing the examiner why the invention would not have been obvious in light of the prior art references. Appeals through the Patent Trial and Appeals Board provide

---

what the POSITA and the marketplace actually know and believe, not what they might believe in a hypothetical, counterfactual world.”). See also In re Winslow, 365 F.2d 1017, 1020 (C.C.P.A. 1966) (presuming a POSITA be working in the shop and having knowledge of all the prior art references hanging on the walls around him); In re Rouffet, 149 F.3d 1350, 1357 (Fed. Cir. 1998) (indicating that a POSITA is expected to have knowledge of even hidden or difficult to locate prior art); KSR Int’l Co., 550 U.S. at 413 (considering the creative steps and assumptions a POSITA in the field would apply).

147 Simon, supra note 130, at 315.

148 Id.

149 Id. at 346-51.

150 Unigene Labs., Inc. v. Apotex Labs., Inc., 655 F.3d 1352, 1361 (Fed. Cir. 2011) (stating that a formulation is "not obvious if a person of ordinary skill would not select and combine the prior art references to reach the claimed composition or formulation"), cert. denied, 132 S. Ct. 1755 (2012).
additional safeguards for overturning wrongful findings of obviousness.\textsuperscript{151}

\textbf{B. Revisiting § 112(f) In Prosecution}

In prosecution, § 112(f) is not an effective narrowing mechanism. The inventor may avoid the restrictions of § 112(f) by simply changing the wording of the claim to avoid triggering § 112(f).\textsuperscript{152} By adding sufficient structure to the claim or avoiding the use of functional language, a patentee may amend his claims to simply fall outside of the statute.\textsuperscript{153} The patentee may alternatively cancel the claim completely, thus avoiding the issue altogether. Because the claim has not issued yet, the examiner and patentee have more flexibility to negotiate the claims of the inventive contribution and to determine the appropriate scope for the invention.\textsuperscript{154}

§ 112(f) may be helpful to supplement nonobviousness in cases where a broad claim would otherwise be invalidated for being obvious. Under those circumstances, invoking § 112(f) may save the claim, albeit only under a very narrow interpretation.\textsuperscript{155} For example, in Amazon’s one-click checkout claim, a broad claim claiming the one-click checkout functionality from a shopping


\textsuperscript{152} LightingWorld, Inc. v. Birchwood Lighting, Inc., 382 F.3d at 1359.

\textsuperscript{153} Claims that are not functional or provide structure are not means-plus-function claims.

\textsuperscript{154} Halliburton Energy Servs., Inc., 514 F.3d at 1255 (indicating that during prosecution the examiner and patentee may negotiate on the claim language and scope of the claim).

\textsuperscript{155} 35 U.S.C. § 112(f) (2012). By reading in the specification, a functional claim that would otherwise have been found obvious may instead be deemed valid if it is narrowed to a specific implementation.
website would not pass the nonobviousness requirement.\textsuperscript{156} However, under §112(f), the one-click technology may be valid, but restricted to only shopping websites that store user credentials in the form of cookies once the user has logged into the website.

However, this limited use of §112(f) seems unrealistic in the context of prosecution because the patentee still holds the power to amend the claims.\textsuperscript{157} Because the patentee knows his invention the best, it is in the patentee’s best interest to amend the claim under his terms, rather than having the examiner read the specification into the claim. In practice, because it is easy to avoid infringing means-plus-function claims due to its narrow scope, patentees will opt to amend the claim instead of settling for a means-plus-function claim.\textsuperscript{158} It is also more efficient for the examiner to reject the claim for obviousness than to go through the mental gymnastics to find a reason to apply §112(f) and further analysis to find a restrictive, narrow reading. §112(f) may not be needed at all, if not sparingly used to allow the occasional, intentionally, narrow claim during prosecution.

IV. ADDRESSING OVERBROAD FUNCTIONAL CLAIMS POST-ISSUANCE THROUGH MARKMAN HEARINGS

While it is better to prevent overbroad functional claims from getting issued in the first place, courts have a second opportunity to tackle overbroad software claims post grant when they resurface in litigation. More recently, the PTO’s post

\textsuperscript{156} U.S. Patent No. 5,960,411 (filed Sept. 12, 1997).

\textsuperscript{157} Halliburton Energy Servs., Inc., 514 F.3d at 1255

\textsuperscript{158} Id.
grant proceedings and *inter partes* review have become a popular mechanism for third parties to invalidate issued patents in parallel with litigation, but that discussion is beyond the scope of this paper. The paper instead will focus on how courts may better address validity through Markman hearings to reduce litigation.

The goal post-issuance is to figure out what exactly is the invention, so that courts can retroactively narrow down the scope of the overbroad claim or invalidate the claim if it is obvious. Typically, in patent litigation, courts utilize Markman hearings prior to trial to determine the meaning of disputed claim elements as a matter of law.\(^{159}\) Narrowing claims and evaluating the validity of claims earlier in the proceeding reduces expensive litigation costs and saves courts from wasting time hearing cases involving invalid patents.

Unfortunately, the Federal Circuit has limited the ability of courts to invalidate bad patent claims during claim construction by divorcing claim interpretation from claim validity issues such as nonobviousness.\(^{160}\) Instead, the Federal Circuit conducts claim construction without consideration of the inventor’s actual inventive contribution to avoid addressing validity.\(^{161}\) Although the Federal Circuit adopted this approach to simplify litigation proceedings, the end result is more costly as judges are more likely to improperly construe claims or determine claim scope without knowledge of the inventor’s inventive contribution to the art.\(^{162}\) Thus, although the Federal Circuit will need to revise its


\(^{160}\) *Phillips v. AWH Corp.*, 415 F. 3d at 1313; *United States v. Adams*, 383 U.S. at 49 (1966); Merges and Duffy, *supra* note 138, at 769, n.2.

\(^{161}\) *Phillips*, 415 F. 3d at 1313.

\(^{162}\) *Id.*
approach to claim interpretation in order for courts to consider questions of validity, such as nonobviousness during a Markman hearing, enabling courts to address validity pretrial is well worth the effort.

Even applying Lemley’s solution during Markman hearings will require the Federal Circuit to consider questions of validity. The Federal Circuit throws a wrinkle into Lemley’s solution as a result of its disparate interpretation of the § 112(f) statute.\textsuperscript{163} Lemley’s approach requires that courts to first determine the alleged \textit{inventive contribution} in order to restrict the entire claim to the scope presented by the specification.\textsuperscript{164} However, the Federal Circuit does not consider the merits of the overall inventive contribution in its interpretation of § 112(f) at all.\textsuperscript{165} As a result, the use of § 112(f) may not provide the narrowing power Lemley intended it to wield. Additionally, the rebuttable presumption against § 112(f) adds a second layer of claim interpretation, which may further increase litigation. Despite these drawbacks, Lemley’s solution may still help to reduce broad functional claims if the Federal Circuit reforms its interpretation of § 112(f) to include the overall inventive contribution.

\textbf{A. Reforming Markman Hearings to Include Nonobviousness Determinations}

\textit{i. Federal Circuit Divorces Claim Validity from Claim Construction}

Given the importance of the inventive contribution and the Supreme Court’s doctrine that courts should construe patents by “first look[ing] into the art to find what the real merit of the alleged discovery or invention is and whether it has

\textsuperscript{163} Id.


\textsuperscript{165} See infra Part IV.B.
advanced the art substantially,” it is important understand why historically the Federal Circuit chose to divorce claim validity from claim construction.\textsuperscript{166}

One reason the Federal Circuit opted to keep claim interpretation and patent validity issues separate is because it wanted to avoid “mongrel issues,” which include mixed questions of law and fact.\textsuperscript{167} Claim construction is a question of law, while issues pertaining to validity involve underlying questions of fact. The Federal Circuit opted to remove questions of fact in order to simplify claim interpretation and to avoid dependencies on jury findings. As a result, questions involving validity, such as obviousness and inventive contribution are not considered during claim construction.\textsuperscript{168}

This approach is consistent with the Federal Circuit’s reluctance to narrow construction to save claim validity.\textsuperscript{169} Under this canon of construction, if two interpretations are both plausible, the narrower interpretation that preserves the validity of the patent should be selected.\textsuperscript{170} However, in its efforts to avoid addressing validity, the Federal Circuit only applies this rule as a last resort if a claim is still ambiguous after all other tools of claim construction have been

\textsuperscript{166} \textit{Eibel Process Co. v. Minnesota & Ontario Paper Co.}, 261 U.S. at 63; \textit{See also} Merges and Duffy, \textit{supra} note 138, at 769, n.2.

\textsuperscript{167} \textit{Id.}

\textsuperscript{168} Although nonobviousness, itself, is a legal question, because it involves underlying questions of fact, it is not considered by the Federal Circuit during claim construction. \textit{KSR Int’l Co. v. Teleflex Inc.}, 550 U.S. at 413-15 (indicating that nonobviousness is a legal question).

\textsuperscript{169} \textit{Phillips v. AWH Corp.}, 415 F.3d at 1327 (holding that the Federal Circuit has “not endorsed a regime in which validity analysis is a regular component of claim construction”).

\textsuperscript{170} Merges and Duffy, \textit{supra} note 138, at 772, n.1.
exhausted.\textsuperscript{171} As a result, this approach has led to costly litigation when ambiguous claim elements are left unrestricted.\textsuperscript{172}

The Federal Circuit has also established a de novo standard of review for reviewing district court claim interpretations, although this standard of review has become quite controversial for “mongrel issues.”\textsuperscript{173} Despite this, the Federal Circuit has extended this standard of review for reviewing the PTO’s claim interpretations, although prior Federal Circuit cases and the Supreme Court have suggested giving the PTO deference.\textsuperscript{174} Because of the controversy over the standard of review, the Federal Circuit may have intentionally kept validity separate from claim construction in order to preserve its power to determine claim construction without having to defer to district court findings of fact.\textsuperscript{175}

\textsuperscript{171} \textit{MBO Labs., Inc. v. Becton, Dickinson & Co.}, 474 F.3d 1323, 1331 (Fed. Cir. 2007).

\textsuperscript{172} \textit{Liebel-Flarsheim Co. v. Medrad, Inc.}, 385 F.3d 898 (Fed. Cir. 2004), 481 F.3d 1371 (Fed. Cir. 2007) (requiring two Federal Circuit appeals to resolve as a result of the Federal Circuit, initially refusing to restrict the ambiguous claim element to preserve validity and then later invalidating the claim).

\textsuperscript{173} \textit{Markman v. Westview Instruments, Inc.}, 517 U.S. 370 (1996) (indicating that the Federal Circuit has adopted a de novo standard of review for claim construction); \textit{United States v. Selioutsky}, 409 F.3d 114, 119 (2d Cir. 2005) (indicating that the standard of review for mixed questions of law and fact are either de novo or clearly erroneous depending on the question being predominantly legal or factual).

\textsuperscript{174} Merges and Duffy, \textit{supra} note 138, at 805, n.5 (The Supreme Court has held that “an administrative agency is typically entitled to more deference than a district court on factual findings because an agency is thought to have more expertise in its field of regulation.”).

\textsuperscript{175} \textit{Teva Pharms. USA, Inc. v. Sandoz, Inc.}, 135 U.S. 831, 832 (2015) (holding that the Federal Circuit should give deference to district courts for subsidiary findings of fact pertaining when extrinsic evidence is used).
ii. The Significance of the “Inventive Contribution”

Removing validity from claim construction has led the Federal Circuit to approach claim interpretation without consideration of the inventor’s inventive contribution at all, despite the Supreme Court doctrine that “claims are to be construed in the light of the specifications and both are to be read with a view to ascertaining the invention.”176 This is problematic because judges are unable to understand the merits of the inventive contribution and to determine what scope an invention deserves.

Two problems arise when courts proceed to interpret claims without consideration of the patentee’s inventive contribution. First, courts cannot determine if the patent should not have been granted in the first place because the invention was obvious. Because issued patents are presumed to be valid, courts cannot invalidate claims if it cannot show why a claim lacks a nonobvious contribution.177 Second, courts cannot differentiate between “pioneering patents” and those that are “improvement patents” and thus, cannot accurately determine when to award broader scope and when to restrict scope.178 Pioneering inventions have traditionally been awarded broader scope because the invention contributes a function “of such novelty and importance as to mark a distinct step in the progress


177 Microsoft Corp. v. i4i LP., 131 S. Ct. 2238 (establishing that issued patents have a strong presumption of validity).

178 Westinghouse v. Boyden Power Brake Co., 170 U.S. at 537 (holding that “to what liberality of construction these claims are entitled depends, to a certain extent, upon the character of the invention and whether it is what is termed, in ordinary parlance, a “pioneer.”).
of the art, as distinguished from a mere improvement or perfection of what had
gone before.” However, if courts cannot discern the type of invention, then
courts may unfairly narrow the claims of pioneering inventions deserving of
broad scope. Furthermore, it is difficult for courts to determine the scope of
equivalents if it is unaware of the significance of the invention. By leaving such
determinations to a jury to decide, courts lose the opportunity to equip judges,
who are typically more knowledgeable than jurors in the software arts, to
proactively invalidate patents early on in the proceedings.

iii. Introducing the Nonobviousness Doctrine in Markman Hearings

In order to reform Markman hearings so that issues of fact may be considered,
the Federal Circuit should consider adopting the holdings of Teva, which suggests
that judges may make subsidiary fact-findings ancillary to its task of determining
legal questions in pretrial hearings. While the Federal Circuit has interpreted
Teva narrowly, the Federal Circuit should extend the holdings of Teva to allow
courts to rule on legal questions relating to validity issues, such as obviousness,
during pretrial hearings. Since courts are ruling on legal questions based on their
own subsidiary fact findings, it no longer makes sense to separate questions of

179 See id.

180 See infra Part IV.B.3.b.

181 Teva Pharms. USA, Inc. v. Sandoz, Inc., 135 U.S. at 832 (indicating that in some
cases, the district court may make subsidiary findings of fact to determine the meaning of
particular claim terms). See also Robert P. Merges and John F. Duffy, Patent Law and Policy:
Cases and Materials 2015 Update 62, n.3 (Supp. 2015) (suggesting that pretrial hearings
determining legal issues based on their own subsidiary fact findings can be applied for patent
validity issues such as obviousness).
law from questions of fact.\textsuperscript{182} Since claim construction issues are closely tied to issues of validity, allowing courts to consider validity enables courts to preemptively weed out overbroad patents during pretrial hearings. As an additional benefit, judges are also made aware of the inventive contribution by investigating underlying facts, which will allow them to more accurately construe claim elements.

One criticism of using nonobviousness and claim interpretation to tackle overbroad claims is that both nonobviousness and claim interpretation involve elements of subjectivity.\textsuperscript{183} Historically courts have struggled with claim interpretation in patent cases because the determination of inventive boundaries requires subjective interpretation.\textsuperscript{184} The complexity of the technology and the lack of a common standard for drafting software claims have led courts to apply divergent standards when interpreting software claims.\textsuperscript{185} However, since claim interpretation is a necessary part of patent litigation, minimizing the amount of subjectivity involved in claim construction prior to trial instead of during trial may still beneficially reduce future litigation.

Nonobviousness also suffers from being a standard based on a hypothetical POSITA.\textsuperscript{186} The POSITA lies at the heart of the obviousness determination as the scope and content of the prior art, along with differences between the patentee’s

\begin{footnotesize}
\textsuperscript{182} Merges and Duffy, \textit{supra} note 181, at 62, n.3.
\textsuperscript{183} Simon, \textit{supra} note 130, at 347.
\textsuperscript{184} \textit{Id.}
\textsuperscript{185} Chien, \textit{supra} note 22, at 9.
\textsuperscript{186} See \textit{supra} Part III.A.4.
\end{footnotesize}
invention and the prior art are to be considered from the POSITA’s perspective.\textsuperscript{187} Courts will need to determine the level of skill and creativity of the POSITA.\textsuperscript{188} If the standard for POSITA is set too low, then even an insignificant invention will be deemed patentable, whereas if the standard is set too high, then defining a POSITA as an expert will make eligible inventions unpatentable.\textsuperscript{189} Courts may consult expert witnesses to determine the appropriate level of skill in the art.\textsuperscript{190}

B. Revisiting § 112(f) to Weed Out Overbroad Patents Post-issuance

i. Incorporating the Inventive Contribution into the § 112(f) Analysis

The Federal Circuit’s extension of \textit{Teva} to allow courts to make decisions based on the court’s subsidiary fact finding will allow courts to consider the inventive contribution during claim construction.\textsuperscript{191} Even if nonobviousness is not considered during claim construction, the inventive contribution is critical for the proper application of § 112(f).\textsuperscript{192} If § 112(f) is to have an impact in weeding out

\begin{itemize}
\item \textsuperscript{188} \textit{See Simon, supra} note 130, at 347. \textit{See also} Zachary H. Valentine, Comment, A Novel, Nonobvious Approach to Curb Abusive Patent Litigants, 21 ROGER WILLIAMS U. L. REV. 118, 156-58 (2016) (explaining how courts examine nonobviousness by determining a level of ordinary skill in a particular industry).
\item \textsuperscript{190} \textit{Id.}
\item \textsuperscript{191} \textit{Teva Pharms. USA, Inc. v. Sandoz, Inc.}, 135 S. Ct. 831-32 (2015).
\item \textsuperscript{192} \textit{Phillips v. AWH Corp.}, 415 F.3d 1303, 1315 (Fed. Cir. 2005) (holding that patent specification is the most crucial element of an inventor’s claim).
\end{itemize}
patents post-issuance, the Federal Circuit will need to reform its interpretation of § 112(f) to incorporate the inventive contribution into its analysis. The courts must first focus on determining the nonobvious contribution before turning to § 112(f) to restrict the functionality of the inventor’s contribution.

ii. The Federal Circuit’s Interpretation of § 112(f) is Inconsistent with the Textual Meaning of the Statute

The statute § 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 recital of structure . . . and such claim should be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof (emphasis added).” Congress created the § 112(f) statute intending for the entire claim to be limited to the structures disclosed in the specification and its equivalents, not just the means-plus-function element. The Federal Circuit, however, adopts a different interpretation of § 112(f).

Instead, the Federal Circuit interprets the statute to mean that each means-plus-function element should be limited to the corresponding structures disclosed in the specification and the equivalents thereof. All other claim elements are to be given full literal reach and are not limited by the embodiments and equivalents specified in the specification. This approach allows the Federal Circuit to

---

194 Merges and Duffy, supra note 138, at 768, n.1.
195 Phillips, 415 F.3d at 1311.
196 Merges and Duffy, supra note 138, at 769 n.1.
197 Phillips, 415 F.3d at 1313 (holding that the court should interpret the words of an inventor’s claim precisely in the same manner as someone else in the inventor’s field of
construe means-plus-function elements piecemeal without consideration of the overarching inventive contribution as a matter of law. The restrictions of § 112(f) are applied by simply matching a functional element with its corresponding structure in the specification. If no corresponding structure is found, the claim fails the enablement requirement. The rest of the claim elements are given full literal reach beyond the embodiments and equivalents specified in the specification.

### iii. Issues with the Federal Circuit’s Interpretation of § 112(f)

**(a) Restricting Claim Elements Instead of the Overall Function Does Not End Up Narrowing Claims**

Under the Federal Circuit’s approach, the overall invention may not be limited to a particular implementation as intended by the invocation of § 112(f). Because the Federal Circuit does not know what is the inventive contribution, it cannot properly determine the appropriate scope to award the overall inventive functionality. Instead, it may end up restricting functional elements that are not integral to the actual invention, while leaving the overall claim overbroad.

For example, in *Williamson*, the invention of a remote learning system,

---

198 *Id.*

199 *Id.*


202 35 U.S.C § 112(a) (2012).

restricting functional claim element “displaying a visual map of the classroom” to certain devices for display, does not help when the actual invention is the overall idea of providing a remote learning system. 204 However, in other instances, where the inventive contribution happens to also be the functional component, restricting the functional component may be effective. One such example is Amazon’s “single click component,” where restricting the functionality of the single click claim to a particular algorithm, narrows the claim down from all potential single click shopping applications to one specific implementation using cookies where the user has previously logged in before using the single click. 205

On the other extreme, the Federal Circuit may run the risk of over restricting pioneering patents from the broader scope they deserve, such as in the case of Wright’s flying machine. 206 Under the Federal Circuit’s application of § 112(f), Wright’s means for wing warping claim element would have been limited to the specific rope pulley system and would not have covered human knowledge of how to operate the wings. Chief Judge Hand properly appreciated the significance of the inventive contribution, and thus awarded the claim the broader scope it deserved for being a pioneering invention. 207 Thus, it is important for the Federal Circuit to clearly understand and appreciate the significance of the inventive contribution in order to properly limit the scope of the contribution.

204 Williamson v. Citrix Online, LLC, 792 F.3d 1339, 1348 (Fed. Cir. 2015).
206 Wright Co. v. Herring-Curtiss Co., 211 F. 654 at 655 (awarding broader scope for wing warping by construing means to control the rudder to extend beyond a rope-pulley system described in the specification to a pilot having knowledge on how to fly the plane, because he recognized the pioneering contribution of the invention).
207 Id.
(b) The Danger with Determining Equivalents Without Understanding the Alleged Invention

Without consideration of the overarching inventive contribution, the Federal Circuit will also encounter difficulty in determining the equivalents of a particular claim. Under the doctrine of equivalents, equivalence is determined if another device or process performs substantially the same function, in substantially the same way, to achieve the same result. However, without knowing the facts of the inventive contribution, the Federal Circuit will not be able to consider equivalence factors to determine equivalents of the overall inventive contribution. The determination of equivalents is important because a large number of equivalents signals that the claim is overbroad, whereas a small number of equivalents indicates that the claim may be limited to particular implementations. Without knowing what equivalent a claim would encompass, it will be difficult to determine what scope to award a claim. Accordingly, it will be difficult to employ Lemley’s use of § 112(f) to effectively restrict claim scope.

While the doctrine of equivalence does not provide much help in light of the Federal Circuit’s approach, the reverse doctrine of equivalents, however, may provide some guidance for restricting claim scope. The reverse doctrine of equivalents functions much like § 112(f) in preventing the unwarranted extension of claims beyond the intended scope of the inventive contribution. Under this doctrine, devices that perform the same function of the claim, but whose substance lies outside the bounds of the specification, do not infringe. For

210 Id. (finding non-infringement when the later air brake performed the same function
example, a modern day smart phone would fall outside the scope of Morse’s claim for communication using electromagnetic means under the reverse doctrine of equivalents, because it is such a drastically, substantial improvement over the telegraph that it falls outside the scope covered by the claim.

The reverse doctrine of equivalents was meant to prevent pioneering claims from covering future inventions that are beyond the scope of the intended invention. Because it is a powerful tool that wields the same restrictive effect as § 112(f) without the means-plus-function restrictions, the reverse doctrine of equivalents may be used to protect inventions from infringing the thicket of patent claims. While the analysis of the reverse doctrine of equivalents is similar to the Federal Circuit’s approach to § 112(f), the doctrine is rarely used.

The Federal Circuit has never affirmed a finding of non-infringement under the reverse doctrine of equivalence. Perhaps the Federal Circuit has rejected the reverse doctrine of equivalence because it prefers a defined legal test to a discretionary standard. However, if § 112(f) is to be used broadly to restrict but radically improved Westinghouse’s invention in one fell swoop).

211 Id.; see Graver Tank, 339 U.S. at 608-09.
213 Id. See Phillips, 415 F.3d at 1311.
214 Merges and Duffy, supra note 138, at 835.
215 Samuel F. Ernst, The Lost Precedent of the Reverse Doctrine of Equivalents, 18 Vand. J. Ent. & Tech. L., 501-502 (2016) (Forthcoming) (claiming that the Federal Circuit may have avoided the reverse doctrine of equivalence because it is a discretionary policy lever. The paper proposes transforming the reverse doctrine of equivalence into a three-step legal test in order to make the Federal Circuit more likely to adopt it.)
software functional claims, the Federal Circuit should consider bringing back the reverse doctrine of equivalents as a legal test in order to extend the reach of § 112(f) to claims that are not drafted in means-plus-function form.

(c) § 112(f) Introduces a Second Layer of Claim Construction

As discussed earlier, § 112(f) comes with a rebuttable presumption that § 112(f) is not invoked if the inventor has not chosen to write the claim in means-plus-function form.216 In order to apply § 112(f) automatically to all software claims without causing an additional layer of claim construction to determine whether the claim is in fact a means-plus-function claim, the Federal Circuit will need to provide specific guidance for software patents. Current case law has not provided consistent guidance for determining which “nonce words” may trigger § 112(f).217

The Apple court held in a recent case that “whether to draft a claim in broad structural terms is the claim drafter’s choice, and any resulting risk that emanates from that choice is not a basis for a court to rewrite the claim in a means-plus-function format.”218 In order to override the patentee’s choice of claim drafting format and avoid controversy, the Federal Circuit will need to reform how §112(f) is applied for software patents in order to invoke it automatically. Additionally, as Lemley has acknowledged in his paper, the Federal Circuit will also need to provide clear guidance for what constitutes sufficient disclosure of an algorithm

216 See supra Part I.B.
217 See Apple, 757 F.3d at 1299.
218 Id., at 1298.
to satisfy the structure requirement of § 112(f). 219

C. Reforms the Federal Circuit Must Consider to Effectively Use § 112(f) to Restrict Claims

From the discussion in this section, it is clear that in order to overcome the subjectivity and claim construction issues involved with § 112(f), the Federal Circuit must reform its approach to § 112(f) and the doctrine of equivalents and reverse doctrine of equivalents in order to use § 112(f) to restrict claims.

First, the Federal Circuit must incorporate an understanding of the inventive contribution in order to appreciate the significance of the contribution and to determine the proper claim scope. Particularly in weeding out bad patents pretrial during claim construction, the Federal Circuit must consider underlying fact findings, as in Teva, in order to evaluate the validity of inventive contribution. 220

Since claim construction is closely tied to the same underlying facts relating to validity, it makes sense for courts to simultaneously consider nonobviousness during claim construction.

Second, the Federal Circuit must reform its approach to § 112(f) to apply it consistently to software patents. As a first step, it must address the rebuttable presumption against § 112(f) by defining the nonce words that will trigger § 112(f). Without doing so, courts cannot consistently apply § 112(f) without triggering significant litigation over the use of § 112(f). Next, the Federal Circuit must change its interpretation of § 112(f) to restrict the claim as a whole, using its knowledge of the inventive contribution, instead of restricting the claim on an

219 Lemley, supra note 2, at 961. See also Chien, supra note 22, at 9.

element-by-element basis.

Third, the Federal Circuit must be able to determine equivalents in order to properly determine claim scope. The Federal Circuit must either incorporate an understanding of the inventive contribution to be able to utilize the doctrine of equivalents or bring back the reverse doctrine of equivalents in conjunction with its use of § 112(f) in order to determine claim scope. Without such reforms, employing § 112(f) cannot realistically be used to restrict overbroad functional claims to a narrower scope during claim construction.

CONCLUSION

Lemley’s proposal to invoke § 112(f) to restrict software claims by treating every functional element in the claim as a means-plus-function element is a good start. However, given the complexity in determining the applicability of § 112(f) and the difficulty in finding sufficient structural disclosure, this solution is problematic.

This paper instead offers an alternate approach in using nonobviousness to tackle the software problem in two phases. Prior to issuance, examiners should utilize the nonobviousness doctrine to force patentees to amend overbroad functional claims.221 Curing overbroad functional claims prior to issuance will save further efforts down the road where overcoming the validity of an issued patent is much more expensive.222 Post grant, courts may integrate the

221 See Halliburton Energy Servs., Inc., 514 F.3d at 1254 (holding that substituting broad language at the point of novelty does not provide sufficient notice of what the patentee was removing from the public”);

222 See Microsoft Corp., 131 S. Ct. at 2242 (establishing that issued patents have a strong presumption of validity).
determination of validity using nonobviousness during Markman hearings. However, in order to facilitate this, the Federal Circuit will need to consider reforms that allow courts to consider the inventive contribution during claim construction. Doing so will not only allow courts to apply the nonobvious doctrine to determine validity, but also enable courts to properly determine claim scope. Even if Lemley’s approach is used to invalidate claims prior to trial, courts must still understand the inventive contribution in order to invoke the statute as Lemley intended to tackle overbroad software patents.
APPENDIX I

U.S. Patent No. 5,930,474: Internet organizer for accessing geographically and topically based information

A. Functional Claim

26. A system for organizing on-line information into geographically-based areas, said system comprising

a user computer for accessing information in a computer network; and

organizer means for processing requests received from said user computer, said organizer comprising:

a database of information organized into a predefined hierarchy of geographical areas, wherein entries corresponding to each of said geographical areas is further organized into topics; and

search engine means for selecting one of said geographical areas wherein at least one of said entries associated with a broader geographical area is dynamically replicated into a narrower geographical area, said search engine means also comprising means for searching said topics associated with said geographical search area.

B. Functional Abstraction

Describing how the web server provides a user with useful information relating to an out-of-print book in Los Angeles.

In accordance with the teachings of the preferred embodiment, the web organizer server 114, together with other like servers in communication with the ethernet link 110 (i.e., in communication with the Internet access provider), provides subscribing users with a geographically organized perspective of the information available by accessing the Internet. Thus, if a user is interested in finding an out-of-print book, or a good price on his favorite bottle of wine, but does not want to travel outside of the Los Angeles area to acquire these goods, then the user can simply designate the Los Angeles area as a geographic location for which a topical search is to be performed. In this example, the Los Angeles area defines a geographical search area, wherein the geographical search area is defined as an area from which topical information can be accessed, and which is a subset of the entire domain of geographic areas which can be searched for topical information. Thus, the geographic/topical organization format provided in accordance with the preferred embodiment provides the user with a valuable Internet organizing tool, since current Internet search techniques might allow the user to find the information which he is interested in, but at an undesirable location so that the user may be required to search for hours in order to find the goods or services in which he is interested at the appropriate geographic areas.

224 Id. at col. 7, lines 5-29 (Functional abstraction describing the goal of providing information to services in a particular location in text).
C. Abstract Data Type

Illustrated as databases organizing information, i.e., Yellow Pages Database. 225

225 Id. at Fig. 2C (Abstract data types illustrated as databases organizing information); Id. at col. 12, lines 33-45 (Pseudo code).
Pseudo Code

Describing how to utilize the fourth parameter to determine how to return a particular entry by search.

The fourth parameter, signified by the letter m, is an integer number that represents the number of entries to skip. This parameter may be used by the Read subroutine 320 whenever there are more than 50 entries in a list and scrolling is to be supported. In a preferred embodiment, the first search has this value always entered as zero, and subsequent scroll searches increment this value to support scrolling. Finally, the NameKey parameter indicates the name of the folder to display. As used herein, a folder is defined as a list of entries designated by a single name and accessible by that single name. Any entry whose parent folder name matches the name specified will be returned by the search.
D. Data Structure

Showing a record with various information\textsuperscript{226}

\begin{figure}[h]
\centering
\includegraphics[width=0.5\textwidth]{data_structure.png}
\caption{Fig. 13}
\end{figure}

\textsuperscript{226} Id. at Fig. 13 (Data structure disclosing a record in the database); Id. at Table 1-2 (Html source code).
TABLE 1

<table>
<thead>
<tr>
<th>Content-type: text/html</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;HTML&gt;&lt;HEAD&gt;&lt;TITLE&gt;Irvin Directory</td>
</tr>
</tbody>
</table>

TABLE 2

<table>
<thead>
<tr>
<th>Content-type: text/html</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;HTML&gt;&lt;HEAD&gt;&lt;TITLE&gt;Irvin Directory KeywordListing:Secondary</td>
</tr>
</tbody>
</table>
***