

COPYRIGHT SEVERABILITY: THE HURDLE BETWEEN 3D-PRINTING AND MASS CROWDSOURCED INNOVATION

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ABSTRACT

3D-printing is gradually becoming widely accessible to the population, and with accessibility come enthusiasm, participation, and ingenuity. Its continued development reflects a potential surge in technological advancement, bestowing on any person with a computer and the right software the ability to design and create. So far, the utilitarian benefits of designs such as blueprints, schematics, and CAD files have always been safeguarded from copyright over-protection through the doctrine of copyright severability. However, the doctrine is applied inconsistently across different circuits and different factual scenarios. This inconsistency can chill innovation by making it impossible to distinguish aesthetic designs protected by copyright from functional designs that are not. Thus, copyright severability does not do enough to protect innovation as 3D-printing begins to make product design more accessible to the general public. A more suitable solution may lie in the abstraction-filtration-comparison test from the software context of copyright infringement.

INTRODUCTION

It is quickly becoming clear that 3D-printing will be one of the most impactful technologies of the 21st century. The basic idea of 3D-printing, made possible by recent technological advancements, is deceptively simple: instead of sticking material together or cutting it away, we can create it from the ground up. If a printer uses ink to draw a line on a sheet of paper, the end product is just a flat line. If, however, that ink is replaced with liquid crayon a small Crayola wall is produced. In fact, 3D-printing can be employed to produce a “wall” in a more literal sense. In recent years, academics¹ and businesses² have begun to

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¹ See, e.g., Tom Sawyer, *Bigger Better Faster*, ENGINEERING NEWS-REC., Dec. 16, 2013, at 24.

explore the possibility of using 3D-printing to mass-manufacture homes using massive 3D “printers.” In Professor Behrokh Khoshnevis’s lab at the University of Southern California, a 3D-printer uses the “crayon printer” process to experiment with rapid structural fabrication in a method called “contour crafting.”³

The potential of 3D-printing technology extends far beyond new manufacturing applications—rapid creation of buildings is just one example. Its greatest impact is allowing everyday computer users to become hobbyist product designers. Today, developments in computer-aided design (CAD) software and the reduced cost of 3D-printing hardware allow almost anyone with a computer to design their own products. CAD software like SolidWorks or Solid Edge can be run on the vast majority of modern consumer computers and is free for many students.⁴ Mainline 3D-printers can be purchased for less than \$3000.⁵ The result is to enable a far larger segment of the population to design and make their own products, ushering in innovation at a heightened pace. In an age where crowd-sourcing or crowd-funding allow the masses to help achieve goals in a variety of areas, 3D-printing is likely to spark a firestorm of crowd-innovation through hobbyist product design.

Standing in the way of this innovation, however, is copyright law which can cordon off some of the aesthetic features of a product as creative expression.⁶ With more people designing products as hobbyists are empowered by the ease of 3D-printing,⁷ more products can be created with new, unique aesthetics, some of which are sure to possess functional qualities. The doctrine of copyright severability—a product design recapitulation of the idea/expression dichotomy from traditional

² See, e.g., Mary-Ann Rosson, *China: Recycled Concrete Houses 3D-Printed in 24 Hours*, INT’L BUS. TIMES (Apr. 24, 2014), <http://www.ibtimes.co.uk/china-recycled-concrete-houses-3d-printed-24-hours-1445981>.

³ See Lew Sichelman, *Houses Built by Robot? If Scientist Gets his Way*, L.A. TIMES, Jan. 2, 2005.

⁴ See e.g., *Autodesk Software for Students, Educators, and Educational Institutions*, AUTODESK, <http://www.autodesk.com/education/free-software/academic-resource-center> (last visited Nov. 6, 2016); *Solid Edge Student Edition*, SIEMENS, https://www.plm.automation.siemens.com/en_us/academic/resources/solid-edge/student-download.cfm (last visited Nov. 6, 2016).

⁵ See MAKERBOT, <http://store.makerbot.com> (last visited Nov. 6, 2016) (offering four 3D printers for sale, three of which are \$2500 or less).

⁶ See, e.g., *Kieselstein-Cord v. Accessories by Pearl, Inc.*, 632 F.2d 989, 990 (2d Cir. 1980) (holding that the belt buckle design is “principally for ornamentation” and protectable under copyright).

⁷ See Elizabeth Palermo, *How 3D Printing Is Changing Etsy*, TOM’S GUIDE (Aug. 7, 2013, 6:14 PM), <http://www.tomsguide.com/us/3d-printing-changing-etsy,review-1834.html>.

copyright law—is intended to protect the functional aspects of a product’s design from being locked away with its aesthetics. Thus, the functional elements of a product are not considered part of the “work” that is protected under copyright.” Indeed, many 3D-printed products would be covered under copyright severability as “useful article[s]”. Unfortunately, the line separating function from aesthetic is difficult to draw.⁸ Even for traditional copyright, with centuries of jurisprudential experience, Judge Learned Hand noted that “[n]obody has ever been able to fix that boundary, and nobody ever can.”⁹ Modern cases continue to struggle with copyright severability, but now that struggle threatens potential technological advancement. In the area of technology, differences in design are often whittled away iteratively to achieve better results or increased efficiency.¹⁰ Thus, different inventors working independently will often reach the same or similar results and need to build off of each other’s innovations. Consequently, a small miscalculation in the proper level of protection can kill off an entire genus of innovations in its early stages. Although the existence of copyright severability as a doctrine is encouraging—in anticipation of the new innovation facilitated by 3D-printing—the law should err on the side of under-protection at the intersection of copyright and technology in order to avoid stifling its growth.

A more suitable solution may already exist in the computer software context: the abstraction-filtration-comparison test developed by the Second Circuit in 1992.¹¹ The idea behind the test is similar to that of copyright severability as both seek the proper balance between protecting the creative expression of the creator and protecting technological advancement. While copyright severability offers only vague language about separating the utilitarian from the creative,¹² the abstraction-filtration-comparison test provides a more concrete three-step procedure to aid courts in distinguishing between the two. Moreover, the abstraction-filtration-comparison test protects the utilitarian over the creative where both are present in one element. Thus, it possesses the

⁸ See *Nichols v. Universal Pictures Corp.*, 45 F.2d 119, 121 (2d Cir. 1930).

⁹ *Id.*

¹⁰ See e.g., Raphael Orlove, *Photoshop Reveals How All Modern Cars Look The Same*, JALOPNIK (Aug. 28, 2012), <http://jalopnik.com/5938235/photoshopped-grille-swaps-reveal-how-all-modern-cars-look-the-same/>.

¹¹ *Comput. Assocs. Int’l, Inc. v. Altai, Inc.*, 982 F.2d 693, 706–11 (2d Cir. 1992).

¹² See e.g., § 101 (“[T]he design of a useful article, as defined in this section, shall be considered a pictorial, graphic, or sculptural work only if, and only to the extent that, such design incorporates pictorial, graphic, or sculptural features that can be identified separately from, and are capable of existing independently of, the utilitarian aspects of the article”).

appropriate level of under-protection for a novel area of technology like 3D-printing.

I. THE 3D-PRINTING PROCESS AND ITS WIDE ACCESSIBILITY

3D-printing got its name because the process is so similar to ordinary 2D-printing.¹³ With 2D-printing, a user creates a design or a schematic on the computer, and then that information is transferred to a printer which draws out that design on paper. Since the invention of the printing press, ideas communicated in the form of writing have disseminated more rapidly across the world, which in turn facilitated new creative writing. Because Shakespeare's plays were able to be mass-printed and distributed across the world, an entirely different society on the other side of the planet was able to take the basic ideas and archetypes to create *West Side Story*.¹⁴

3D-printing can do the same with technology, with 3D-printers acting as 3D-printing presses. Functionally, 3D-printers simply add an extra dimension of height and replace ink with a liquid material that solidifies as it is expelled. Thus, while a 2D-printer can draw a square on a sheet of paper, a 3D-printer can create a box or a cube by extruding the square up and out from the flat surface. 3D designers generally design models "in the Stereolithography or Standard Tessellation Language ("STL") format."¹⁵ This computer file format breaks a 3D model down into miniscule grains that describe the shape of the model and then cuts the model into many slices, each representing one cross-section of the model.¹⁶ This data is then sent to a 3D-printer, which "prints" those slices, each on top of the one before to form the whole model.¹⁷

The key advantage of this technology "comes from the ability to quickly create remarkably complex shapes, some of which would be impossible using traditional techniques."¹⁸ Part of this advantage stems from the process being additive. Throughout human history, we have hammered, cut, and whittled at wood, stone, metal, and eventually

¹³ See John Hauer, *Why 2D Printing Is Like 3D Printing: A Counter Rant*, TECHCRUNCH (Nov. 25, 2012), <https://techcrunch.com/2012/11/25/why-2d-printing-is-like-3d-printing/>.

¹⁴ See Jack Gottlieb, *West Side Story Fact Sheet*, WEST SIDE STORY (2001), <http://www.westsidestory.com/site/level2/archives/fact/fact.html>.

¹⁵ Frank Ward, *Patents & 3D Printing: Protecting the Democratization of Manufacturing by Combining Existing Intellectual Property Protections*, 25 DePaul J. Art, Tech. & Intell. Prop. L. 91, 97 (2014).

¹⁶ *Id.* at 98.

¹⁷ *Id.*

¹⁸ Lucas S. Osborn, *Of PHDs, Pirates, and the Public: Three-Dimensional Printing Technology and the Arts*, 1 Tex. A&M L. Rev. 811, 814 (2014).

plastic. We harvested lumber, smelted ore, and synthesized polymers only to chop away substantial portions to arrive at the tools we want. With 3D-printing, material is only added, and added meticulously in gossamer layers until the entire object is created. This advantage can easily be seen in the usual manufacturing context: complex shapes can be created easily and no extra material is lost. However, its true impact is revealed when ordinary citizens use it at home.

Before 3D-printing technology became available and feasible as a consumer product, the vast majority of product manufacturing was beyond the grasp of ordinary people. Creating products out of any material required expensive equipment usually available only to businesses, specialized for the sophisticated processes necessary to create modern products. Hobbyists at home may have a band saw, a mill, or maybe even a lathe, but nothing capable of easily creating complex shapes with reasonable precision. Where 2D-printing made it possible for people to easily mass-produce graphics or writing from home with just a computer, word-processing software, and a 2D-printer, 3D-printing does the same for 3D products by substituting in CAD software and a 3D-printer. Although product design may sound like an arcane and specialized endeavor, in recent years, the process has been streamlined and costs reduced to a point where an average person can manufacture their own creations.¹⁹

First, the software used to design has become more accessible. 3D design is accomplished in CAD software that enables users to easily draw lines and shapes that would other have to be drawn tediously by hand.²⁰ 3D CAD software employs an extra dimension to allow users to extrude their flat drawings into voluminous objects.²¹ Similarly, material can be virtually cut away using those same drawings as if the user were wielding a laser of the exact same shape, capable of cutting to an exact depth.²² In the past, access to this type of software was limited by expensive software licenses and the software was installed almost exclusively on computers sitting in the R&D departments of large corporations or laboratories of renowned professors. Today, however, anyone with an Internet connection can download 3D CAD software with an impressive array of functions. For example, students in academic

¹⁹ See *The Free Beginner's Guide: History of 3D Printing*, 3DPRINTINGINDUSTRY.COM, <http://3dprintingindustry.com/3d-printing-basics-free-beginners-guide/history> (last visited Nov. 6, 2016) [hereinafter *History of 3D Printing*].

²⁰ See e.g., SKETCHUP, <http://www.sketchup.com> (last visited Nov. 29, 2016) (example of commercially available CAD).

²¹ See e.g., *id.*

²² See e.g., *id.*

institutions have been able to use student versions of most popular CAD programs free of charge.²³ Since 2006, Google has offered its own 3D CAD software, SketchUp, entirely for free, targeted at “the do-it-yourselfer, the hobbyist—really anyone who wants to build 3D models.”²⁴ Since then, an entire online community has developed around creating and sharing designs created in the software.²⁵

Second, 3D-printers and the material they use have also become cheaper. 3D-printing first became practically and commercially available in 2007, when a printer was sold for less than \$10,000 for the first time.²⁶ Since then, 3D-printing systems have decreased dramatically in price, with even powerful, brand-name printers being sold for less than \$3000.²⁷ Technology analysts have predicted that these same printers could cost less than \$2000 by 2016,²⁸ a price comparable to that of high end computers.

Third, hobbyist-created products have already begun to be sold in online marketplaces. Etsy, an online marketplace focused on handmade products, has a category and entire shops dedicated to 3D-printed products that were designed and manufactured at home by the shop owner.²⁹ Focusing on 3D-printing more specifically, Shapeways is a website whose business revolves entirely around 3D-printed products through two business models. First, it creates a marketplace for users to sell their home-printed products, much like Etsy. Second, it offers a printing service through which users can upload their design files and have Shapeways manufacture them, much like a copy shop for 3D products.³⁰

²³ See e.g., *Autodesk Software for Students, Educators, and Educational Institutions*, AUTODESK, <http://www.autodesk.com/education/free-software/academic-resource-center> (last visited Nov. 6, 2016); *Solid Edge Student Edition*, SIEMENS, https://www.plm.automation.siemens.com/en_us/academic/resources/solid-edge/student-download.cfm (last visited Nov. 6, 2016).

²⁴ Brad Schell, *A Great Day for 3D*, GOOGLE OFFICIAL BLOG (Apr. 27, 2006), <https://googleblog.blogspot.com/2006/04/great-day-for-3d.html>.

²⁵ See 3D WAREHOUSE, <https://3dwarehouse.sketchup.com> (last visited Nov. 6, 2016).

²⁶ See *History of 3D Printing*, *supra* note 19.

²⁷ See MAKERBOT, *supra* note 5.

²⁸ Iain Thomson, *Gartner Forecasts Pro 3D Printer Prices Below \$2,000 by 2016*, THE REGISTER (Mar. 29, 2013), http://www.theregister.co.uk/2013/03/29/gartner_3d_printing_2016.

²⁹ *Popular Items for 3d Printing*, ETSY.COM, https://www.etsy.com/market/3d_printing (last visited Nov. 6, 2016).

³⁰ See SHAPEWAYS, <http://shapeways.com/> (last visited Nov. 6, 2016).

With entire markets and ecosystems already existing for them, it is not hard to imagine multitudes of ordinary people becoming design hobbyists in the near future. The area of product design, however, involves creator choices with regard to both aesthetics and function, and the former can be removed from use by the general public. Copyright law recognizes the delicate balance that must be struck here and makes an attempt through the doctrine of severability. The doctrine, however, does not do enough to protect function.

II. THE INTENDED SAFEGUARD OF COPYRIGHT SEVERABILITY

Copyright severability is the law's attempt to determine what elements of a product are protected under copyright when the product has both expressive and functional features. When the doctrine was codified, its intended purpose was "to draw as clear a line as possible between copyrightable works of applied art and uncopyrighted works of industrial design."³¹ It is necessary because the copyright statutes protect "[p]ictorial, graphic, and sculptural works."³² At first glance, these words seem to point to artistic works, but actually "include two-dimensional and three-dimensional works of fine, graphic, and applied art, photographs, prints and art reproductions, maps, globes, charts, diagrams, models, and technical drawings, including architectural plans."³³ Using the products on Etsy or Shapeway as examples, it is easy to see how hobbyist-made products might fall within its ambit.

The copyright statute also codifies the doctrine of copyright severability.³⁴ The "three-dimensional works" discussed before "include works of artistic craftsmanship insofar as their form but not their mechanical or utilitarian aspects are concerned."³⁵ Thus, the functional elements of a product are not considered part of the "work" that is protected under copyright. To help distinguish between "form" and "mechanical or utilitarian aspects," the statute explains that the former "incorporates pictorial, graphic, or sculptural features that can be identified separately from, and are capable of existing independently of, the utilitarian aspects."³⁶ Regulations promulgated by the Copyright Office contain similar language and state that "a pictorial, graphic, or sculptural work . . . must embody some creative authorship in its delineation or form."³⁷

³¹ H.R. REP. NO. 94-1476, at 55 (1976).

³² 17 U.S.C. § 101 (2012).

³³ *Id.*

³⁴ *See id.*

³⁵ *Id.*

³⁶ *Id.*

³⁷ 37 C.F.R. § 202.10 (2016).

A. Similarity to the Idea/Expression Dichotomy

Copyright severability is much like the idea/expression dichotomy,³⁸ but for items that have functional elements. It is an evolution of the idea/expression dichotomy, developed to protect technology at points where it intersects with expressive elements within the same item. The idea/expression dichotomy is codified as well, and prevents copyright protection from “extend[ing] to any idea, procedure, process, system, method of operation, concept, principle, or discovery.”³⁹ The motivation behind it is to protect an author or artist’s unique, expressive choices while anchoring the basic, sometimes universal, ideas and facts in the public domain for all to use.⁴⁰ The doctrine recognizes that the author or artist borrowed and made use of the idea or fact in creating the work, and that the purpose of copyright is to promote more works, so future creators may have to use the same fact or idea.

Copyright severability follows similar principles, but with subtle differences. Copyright severability protects utilitarian aspects instead of ideas and facts, recognizing that granting exclusive rights over the functional portions of an item is the realm of patent law. The motivation, however, is similar. Much like future authors may need to borrow the same ideas used by authors today, creators of products often need to rely on the same functions or utilitarian elements of a product in a technological context. For example, even if the first corrugated handle on a flashlight was a purely aesthetic design choice, its function of increasing grip may need to be used by future flashlight designers. Consequently, there is perhaps an even greater need to protect function, as choices made with utilitarian concerns in mind are often limited by efficiency, safety, and the technological limitations of the time. Copyright severability was developed to afford a protective zone where technology could not be hindered by copyright.

B. The Line-Drawing Quandary

While the statutory language laying out copyright severability may seem clear on paper, drawing the line between “form” and “mechanical and utilitarian aspects” can be difficult.⁴¹ Many things in our modern world feature both aesthetic and utilitarian elements, and this is even truer of product design. Many human creations or inventions

³⁸ See *Golan v. Holder*, 132 S. Ct. 873, 890 (2012) (“[E]very idea, theory, and fact in a copyrighted work becomes instantly available for public exploitation at the moment of publication”; the author’s expression alone gains copyright protection.” (quoting *Eldred v. Ashcroft*, 537 U.S. 186, 219 (2003))).

³⁹ 17 U.S.C. § 102(b).

⁴⁰ *Campbell v. Acuff-Rose Music*, 510 U.S. 569, 575 (1994).

⁴¹ 37 C.F.R. § 202.10.

were inspired by nature and, in particular, by animals. For example, a person who designs a new type of airplane wing may seek to emulate the graceful, natural shapes of a particular bird's feathered wings, and the design may turn out to offer greater efficiency for planes that utilize it. How would copyright severability draw the line between form and function, when nature itself selected that form to achieve a specific function? It may be possible for a court to decode exactly which bird-like elements contributed to efficiency and which did not.

This example may seem exaggerated, but biomimicry has frequently been the source of human innovations. Most recently, Japan's Shinkansen bullet trains faced the problem of creating loud, disruptive shock-waves as they exited tunnels, a consequence of the compressed air that accumulated in front of the train at high speeds.⁴² Engineers ultimately solved the problem after watching kingfishers dive into water, reshaping the front of the train to resemble a kingfisher beak. The shape allows air to be displaced more fluidly so as to not create a "tunnel boom," and it also increases the efficiency of the train by fifteen percent.⁴³ If an engineer were to claim the design inspired by the kingfisher before the tunnel boom problem was discovered, it is hard to see where copyright severability would be able to draw a clear line. Here, the utilitarian aspects would be inherent in—and inseparable from—the aesthetic design.

The Second Circuit addressed a legal example of this distinction in a case about mannequins of human torsos used to display articles of clothing.⁴⁴ The plaintiffs designed four human torso mannequins that were "life-like and anatomically accurate" with "hollow backs designed to hold excess fabric when the garment is fitted onto the form."⁴⁵ The defendants contracted to have the mannequins produced for their own display purposes, and the plaintiffs sued for copyright infringement.⁴⁶ The court noted that because the mannequins were "concededly useful articles, the crucial issue . . . [was] whether they possess artistic or aesthetic features that are physically or conceptually separable from their utilitarian dimension."⁴⁷ Ultimately, the court held "that since the

⁴² Chris Peterson, *Biomimicry—Japanese Trains Mimic Kingfisher*, BIRDNOTE (Mar. 21, 2013), <http://birdnote.org/show/biomimicry-japanese-trains-mimic-kingfisher>.

⁴³ *Id.*

⁴⁴ See *Carol Barnhart Inc. v. Econ. Cover Corp.*, 773 F.2d 411 (2d Cir. 1985).

⁴⁵ *Id.* at 412.

⁴⁶ *Id.*

⁴⁷ *Id.* at 414.

aesthetic and artistic features of the mannequins [were] inseparable from the forms' use as utilitarian articles the forms are not copyrightable."⁴⁸

Although in this case the court errs on the side of protecting functionality, the line drawn is no clearer than before. Much of the court's analysis turns on its classification of the mannequins as "utilitarian articles" and seems to focus on how the mannequins were used or intended to be used. What would be the result if the mannequins began as sculptures that the artist intended to sell as art pieces, but ultimately sold to stores to be used as displays? The idea of utilitarian uses seems to inform the proper test, but many sculptures modeled after humans or other realistic objects are capable of possessing a utilitarian purpose. This is but one example of courts grasping for the proper way to apply copyright severability, and more recent cases reveal a number of different tests across various circuits.

III. VARIOUS APPLICATIONS OF COPYRIGHT SEVERABILITY

A number of different courts have faced the problem of determining what aspects of an item are severable and protectable under copyright. Each court has engaged in a different analysis that could produce different results if applied to the facts of one of the other cases. The result is to turn what was intended to be a uniform doctrine for copyright severability into a patchwork of different doctrines across the various circuits.

A. Another Application by The Second Circuit

Two years after the clothing display mannequin case, the Second Circuit was faced with a bike rack that was bent into the shape of a wave.⁴⁹ The bike rack fit squarely into the uncertain legal space left after the court found mannequins to be utilitarian articles that were not copyright severable: the bike rack began as pure art and its utility was discovered later. The owner of the design "testified, that the original design of the RIBBON Rack stemmed from wire sculptures that Levine had created" and "had displayed in his home as a means of personal expression."⁵⁰ It was only after "he accidentally juxtaposed the bicycle sculpture with one of the self-standing wire sculptures" that he discovered its utilitarian elements.⁵¹

It is hard to predict what the result would be here if the previous test were applied. The mannequins were designed for the purpose of displaying clothes, a seemingly utilitarian purpose that explains the

⁴⁸ *Id.* at 418.

⁴⁹ *Brandir Int'l, Inc. v. Cascade Pac. Lumber Co.*, 834 F.2d 1142 (2d Cir. 1987).

⁵⁰ *Id.* at 1146.

⁵¹ *Id.*

court's categorization of it as a utilitarian article. The creator here would argue that the bike rack originated from pure art and was adapted into a larger sculpture that also offered a utilitarian purpose *ex post*. Does this make the sculpture not a utilitarian article, or would the fact that its appeal stems from its merging of aesthetics and function make it not severable? The answer is unclear.

Here, the court adopted a test offered by Professor Denicola⁵²: “if design elements reflect a merger of aesthetic and functional considerations, the artistic aspects of a work cannot be said to be conceptually separable from the utilitarian elements”⁵³ and cannot be copyrighted. On the other hand, “where design elements can be identified as reflecting the designer’s artistic judgment exercised independently of functional influences, conceptual separability exists.”⁵⁴ The court applied this test to the bicycle rack and ultimately found that “the form of the rack [was] influenced in significant measure by utilitarian concerns” and was not copyrightable. The emphasis here is on the motivations behind a creator’s design choices. Part of the inquiry seems to ask whether the creator compromised on certain artistic elements to satisfy a functional requirement, but no part of the test seems “to draw as clear a line as possible.”⁵⁵

B. Another Case of Mannequins

Mannequins have proven to be an area of difficulty for copyright severability, and the Seventh Circuit dealt with its own case in 2004.⁵⁶ The plaintiff designed mannequins of the human head “that would imitate the ‘hungry look’ of high-fashion, runway models,” believing they “could be marketed as a premium item to cutting-edge hair-stylists and to stylists involved in hair design competitions.”⁵⁷ Years later, after the mannequin proved successful, the plaintiff found a competitor selling a mannequin “which was very close in appearance” and sued for copyright infringement.

The plaintiff first argued that the mannequin “[was] not a ‘useful article’ for purposes of [17 U.S.C.] § 101 because its ‘inherent nature is to portray the appearance of runway models,’”⁵⁸ and thus there were no useful elements that required analysis under copyright severability. The

⁵² Robert C. Denicola, *Applied Art and Industrial Design: A Suggested Approach to Copyright in Useful Articles*, 67 Minn. L. Rev. 707, 741 (1983).

⁵³ *Brandir*, 834 F.2d at 1145.

⁵⁴ *Id.*

⁵⁵ H.R. REP. NO. 94-1476, at 55 (1976).

⁵⁶ *Pivot Point Int’l, Inc. v. Charlene Prods., Inc.*, 372 F.3d 913 (7th Cir. 2004).

⁵⁷ *Id.* at 915.

⁵⁸ *Id.* at 919.

court rejected this argument and largely adopted the test in *Carol Barnhart*, examining whether “the artistic aspects of an article can be ‘conceptualized as existing independently of their utilitarian function.’”⁵⁹ The face on the mannequin was held to be severable from the mannequin as a whole, because it is possible “to conceive of a different face than that portrayed on the [plaintiff’s] mannequin” or even one “that portrays the ‘hungry look’ on a high-fashion runway model.”⁶⁰

Although the court adopts the same test as the Second Circuit here, the application departs dramatically. The court here places great emphasis on the fact that different faces could have been used on the mannequin with similar functional effect, an inquiry that was largely ignored by the Second Circuit. There was no evidence in *Carol Barnhart* that all the relative size proportions or relative locations of specific torso features served functional uses on the mannequins, so it is possible that the Seventh Circuit would find those aspects copyrightable. Thus, because the defendant had contracted to have mannequins made that “were ‘copied from Barnhart’s display forms,’”⁶¹ they unquestionably would have taken elements that were not all necessarily functional in nature.

C. Fourth Circuit Synthesis for Decorative Elements of Furniture

The Fourth Circuit dealt with a case where one furniture manufacturer frequently imitated the designs of its competitors and sold similar pieces at a lower price.⁶² The plaintiff hired a design firm to procure intellectual property rights over furniture designs it wanted to manufacture. The designer asserts that he used “references as inspiration and combined elements from the public domain to ‘create a different look than has been seen before,’” and “[a]lthough he was influenced by functional concerns in designing the furniture, [he] was also motivated by aesthetic goals.”⁶³ Thus, the process used would seem to produce “design elements [that] reflect a merger of aesthetic and functional considerations” where “the artistic aspects of a work cannot be said to be conceptually separable from the utilitarian elements,” as elucidated by the Second Circuit in *Brandir*.⁶⁴

⁵⁹ *Id.* at 931 (citing *Carol Barnhart Inc. v. Econ. Cover Corp.*, 773 F.2d 411, 418 (2d Cir. 1985)).

⁶⁰ *Id.*

⁶¹ *Carol Barnhart*, 773 F.2d at 413.

⁶² *Universal Furniture Int’l, Inc. v. Collezione Europa USA, Inc.*, 618 F.3d 417 (4th Cir. 2010).

⁶³ *Id.* at 425.

⁶⁴ *Brandir Int’l, Inc. v. Cascade Pac. Lumber Co.*, 834 F.2d 1142, 1145 (2d Cir. 1987).

However, the Fourth Circuit did not choose this path of analysis. The court walked through the statutory language describing copyright severability as well as prior cases addressing the issue,⁶⁵ before ultimately drawing from all of them and “[s]ynthesizing the[] principles.”⁶⁶ First, the court quoted *Carol Barnhart* to highlight that the decorative elements of the furniture were “‘wholly unnecessary’ to the furniture’s utilitarian function,”⁶⁷ but ignored the Second Circuit’s later emphasis on whether or not a designer “was influenced by functional concerns.”⁶⁸ Next, the court quoted *Pivot Point* to highlight an instance where “‘artistic judgment [was] exercised independently of functional influences’”⁶⁹ before immediately conceding that “[t]o be sure, [the designer] was influenced by function in designing these decorative elements.”⁷⁰ Finally, though, the court granted copyright protection to the decorative elements because “design and placement of the[] decorative elements was not ‘as much the result of utilitarian pressures as aesthetic choices’”⁷¹ and because the “[a]esthetic choices were the dominant force at work . . . in [the] design process.”⁷²

The synthesizing approach adopted here is bewildering, as bits and pieces of previous decisions with varying fact patterns are stitched together in mismatched ways. If the designer took functional concerns into consideration, then *Brandir* should have made it clear that the decorative elements were not severable, regardless of whether they were actually conceptually severable under *Carol Barnhart*. Similarly, *Pivot Point* granted copyright protection where the artistic design was selected without concern for function, but the Fourth Circuit used it to support its own balancing test between whether “utilitarian pressures” or “aesthetic choices” were “the dominant force” at work.⁷³ It is unclear what the touchstone for finding copyright severability really is, or which analyses from previous cases hold greater weight. This is the kind of analysis that currently guides the doctrine, and there is reason to be fearful of its application as 3D-printing enters mainstream use.

⁶⁵ See *Universal Furniture*, 618 F.3d at 432–33.

⁶⁶ *Id.* at 434.

⁶⁷ *Id.* (quoting *Carol Barnhart Inc. v. Econ. Cover Corp.*, 773 F.2d 411, 419 (2d Cir. 1985)).

⁶⁸ *Brandir*, 834 F.2d at 1145.

⁶⁹ *Universal Furniture*, 618 F.3d at 434 (quoting *Pivot Point Int’l, Inc. v. Charlene Prods., Inc.*, 372 F.3d 913, 931 (7th Cir. 2004)).

⁷⁰ *Id.*

⁷¹ *Id.* (quoting *Pivot Point*, 372 F.3d at 931).

⁷² *Id.*

⁷³ *Id.*

IV. REASONS TO BE WARY AS 3D-PRINTING FLOURISHES

One of the key concerns with having a doctrine that is applied so inconsistently stems from the fact that technological progress produces converging results. Efficiency, cost, or even technological limitations force the continual improvement of designs and artistic elements become increasingly constrained by functional concerns once they are integrated in products. The result is that multiple, independent designers with different origin points may have their designs incrementally improved to a point of similarity that could cause problems in copyright law. For example, although the fronts of cars were once box-shaped, decades of iterative design processes have crowned thinner, sleeker designs as the most fuel-efficient options and now the most aerodynamic cars all share a similar design.⁷⁴ Thus, elements that may have been born out of artistic choices can nonetheless develop functional concerns later that can severely restrict future innovators.

The problem is illustrated well by the mannequin head case addressed by the Seventh Circuit that was explored earlier.⁷⁵ It was easy for the court to say that there are innumerable different “faces” that the designer could have used on the mannequins, or even faces with “the ‘hungry look’ of high-fashion, runway models,”⁷⁶ but the reality of manufacturing and efficiency is not so simple. First, there may not be as many hungry looks as the court believes; perhaps the hungry look leans more toward an idea than an expression. Second, the number of viable hungry looks may be limited by the amount of material needed for creation or the ease of the manufacturing process. This issue becomes more pertinent with the additive manufacturing process involved in 3D-printing. While in the past, a manufacturer might purchase the same amount of clay in manufacturing the mannequins, the cost savings of using an additive approach may cause subtle differences, driven by artistic choices, to make one mannequin face more economic than another. In this case, can a court still hold that the face is not functional when the design itself impacts cost and manufacturing efficiency concerns?

Another problem is that unclear application may have a chilling effect on future innovators. Copyright infringement is imposed on a strict liability basis so product designers cannot create new products free of fear that their pursuit of a better design will be protected by a good faith

⁷⁴ See Don Sherman, *Drag Queens: Aerodynamics Compared*, CAR & DRIVER (June 2014), <http://www.caranddriver.com/features/drag-queens-aerodynamics-compared-comparison-test>.

⁷⁵ *Pivot Point*, 372 F.3d 913.

⁷⁶ *Id.* at 915.

creative process. Indeed, lawsuits have already begun to make hobbyist designers aware of the potential liability they face.⁷⁷ If circuit courts struggle to draw the line between artistic and functional, then an ordinary hobbyist at home has no hope of discerning when they are adopting functional aspects of someone else's design, and when they are infringing on the aesthetic, expressive elements. With hobbyist designers emerging across the country, a clearer test is needed to facilitate the dramatic growth in product design.

Furthermore, the creative ecosystem that hobbyist designers work in is distinct from that of the copyright world. History has shown that authors and artists need copyright protection as an incentive to produce new works, but the same is not true of the new world of online design communities. In communities like 3D Warehouse, creators share freely with each other, driven by their passion for design and their desire to show their creations to others. The motivations are drastically different from those in traditional copyright. Where more rights may lead to more innovation in traditional intellectual property regimes, increased openness and sharing are what drive innovation with today's hobbyist designers. Thus, a clearer and more suitable legal test is necessary to facilitate, rather than stifle, this new sprouting branch of innovation.

V. A POTENTIAL SOLUTION IN SOFTWARE COPYRIGHT

Copyright severability was created to allow courts to handle situations where copyright conflicts with technological innovation. This doctrine, however, is not the only area where this occurs given that similar problems have arisen with computer software, where courts needed a way to protect essential functions and ideas within a program, while allowing coders to preserve their rights over the more creative, non-functional aspects of their code. The situations are similar because here too, the technology is convergent, with programming improvements usually shedding extraneous lines or being reorganized to run more efficiently, until multiple independent formulations become gradually more similar. Thus, the test applied to software is better suited to product design—with the potential to advance technology—than any of the copyright severability tests courts have created so far.

A. The Abstraction-Filtration-Comparison Test

The test employed by courts in the software context is the abstraction-filtration-comparison test, developed by the Second Circuit in

⁷⁷ See Clive Thompson, *Clive Thompson on 3-D Printing's Legal Morass*, WIRED (May 30, 2012), <https://www.wired.com/2012/05/3-d-printing-patent-law/>.

1992.⁷⁸ Perhaps its late conception, after copyright severability was already developed and codified, is why it was never applied to product design. The test involves three steps and is designed to determine what elements of a computer program (or as applied here, product) are protectable under copyright. The first step is abstraction, which breaks down each feature of a product into its most basic function.⁷⁹ The second step is filtration, where all the features that can be reduced to functions are filtered out of the copyright analysis.⁸⁰ The last step is comparison, where the remaining non-functional, non-utilitarian features of the two products are compared to assess copyright infringement.⁸¹

The first application of the test in *Computer Associates International Inc. v. Altai* demonstrates why it is more suitable when the subject matter concerns technological design choices.⁸² Here, the owner of a copyrighted computer program brought a claim for infringement of elements of the software. The court described the abstraction step as “begin[ning] with the code and end[ing] with an articulation of the program’s ultimate function.”⁸³ The code in this situation is the design choice, similar to the shape of the bike rack or the design of the head mannequins discussed before.

The filtration step involves “examining the structural components at each level of abstraction to determine whether their particular inclusion at that level was ‘idea’ or was dictated by considerations of efficiency”⁸⁴ and removing them from the infringement analysis. This serves the dual purpose of leaving ideas in the public domain and ensuring future designers can utilize the same functional elements. For software, it is known ideas in the software field as well as particular structures of the code that made it more efficient. For product design, it is also known ideas in that particular product field as well as design choices that contribute to its function.

Finally, the comparison step involves comparing the remaining, non-functional, non-idea elements for copyright infringement, ensuring that copyright protects only the purely aesthetic elements. By reducing the code to its “ultimate function,” the test errs on the side of protection function over aesthetics and guarantees that future programmers can build on those same structures to continue improving the code’s efficiency.

⁷⁸ See *Comput. Assocs. Int’l, Inc. v. Altai, Inc.*, 982 F.2d 693 (2d Cir. 1992).

⁷⁹ See *id.* at 706–07.

⁸⁰ See *id.* at 707–10.

⁸¹ See *id.* at 710–11.

⁸² See *id.*

⁸³ *Id.* at 707.

⁸⁴ *Id.*

B. Application of the Test to Copyright Severability Cases

The previous cases examined offer examples of how the test can be applied to products. At the abstraction step, the wave shape of the bicycle rack in *Brandir* is broken down to the function of permitting more bicycles to be stored in less space.⁸⁵ At the filtration step, that space-saving function, made possible by the wave shape, is filtered out and is no longer protectable under copyright. Finally, at the comparison step, only the remaining elements—such as color or engravings on the metal of the shape itself—are compared for copyright infringement, and future bike rack designers can utilize the functional wave shape without fear of infringing.

The mannequin in *Carol Barnhart* served the function of propping up clothes for display⁸⁶. At the abstraction step, any features of the human torso that served that function could be abstracted. For example, if the slope of the shoulder was an aesthetic design choice that also happened to make it easier to place clothes on the mannequin or prevent the clothes from slipping off, then that element would be functional. At the filtration step, that element would be filtered out from copyright protection. Any remaining non-functional elements would have copyright protection.

The same would be applied to the head mannequins in *Pivot Point*, with one function as providing a basic model for hairstylists to work on, and a second function that reduces the “hungry expression into providing a specific expression that enhances the hairstylist’s work.”⁸⁷ Thus, the plaintiff would be granted protection for their particular creative expression of the “hungry look,” but not the look itself as an entire category of facial expressions. Finally, the decorative elements of furniture in *Universal Furniture* would not be able to be abstracted as the particular designs add no new function to the product that it would not otherwise have without the designs.

It is true that depending on how permissively one reads “non-functional” elements, all elements of a particular design could serve some function. This, however, is the intent of the abstraction-filtration-comparison test: to choose under-protection wherever there is doubt about whether a copyrightable element may have functional effect. Courts would longer have to determine whether a design “possess[es] artistic or aesthetic features that are physically or conceptually separable

⁸⁵ *Brandir Int’l, Inc. v. Cascade Pac. Lumber Co.*, 834 F.2d 1142, 1147 (2d Cir. 1987).

⁸⁶ *Carol Barnhart Inc. v. Econ. Cover Corp.*, 773 F.2d 411, 412 (2d Cir. 1985).

⁸⁷ *Pivot Point Int’l, Inc. v. Charlene Prods., Inc.*, 372 F.3d 913, 915 (7th Cir. 2004).

from their utilitarian dimension,”⁸⁸ or whether it “it reflect[s] the designer’s artistic judgment exercised independently of functional influences.”⁸⁹ There is no need to determine which was “the dominant force at work . . . in [the] design process.”⁹⁰ As long as a defendant can show that there is a functional element to a particular design, that element loses its copyright, regardless of separability, what influenced the design, or whether function or aesthetics was the dominant force. This test offers a clearer, more easily applicable test for products, and errs on the side of keeping innovation outside the shackles of copyright.

CONCLUSION

To accommodate the new innovative ecosystem made possible by the Internet and the increased accessibility of 3D-printing, courts should adopt the abstraction-filtration-comparison test from copyright cases addressing software. The traditional doctrine of copyright severability is poorly equipped to protect technological innovation where it coincides with copyrightable expression. Its tests have been applied inconsistently with incongruous results across different circuits. Consequently, hobbyist designers at home have no way of knowing what elements of an interesting and beneficial design they see online may be protected by copyright, and they are discouraged from borrowing them to develop their own improvements. Conversely, the abstraction-filtration-comparison test was created to help courts address copyright issues created by emerging technologies and is better suited to protecting technological innovation. The test itself is clear and its method of analyzing for function naturally errs on the side of protecting technological innovation. Hopefully, by applying this test, courts can allow new avenues for innovation to flourish and enable ordinary people designing for fun at home to become modern day inventors.

⁸⁸ *Carol Barnhart*, 773 F.2d at 414.

⁸⁹ *Brandir*, 834 F.2d at 1145.

⁹⁰ *Universal Furniture Int’l, Inc. v. Collezione Europa USA, Inc.*, 618 F.3d 417, 434 (4th Cir. 2010).