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HARMONIZING THE CONVERGENCE OF MEDIUM, EXPRESSION, AND FUNCTIONALITY: A STUDY OF THE SPEECH INTEREST IN COMPUTER SOFTWARE

Steven E. Halpern[*]

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* Associate, Brown Raysman Millstein Felder & Steiner LLP, New York, NY. The opinions represented herein do not necessarily reflect the views of the firm. The author would like to recognize the contributions of Professor John R. Kettle, III and Elizabeth Shea. This article is dedicated to Professor Ken Keaton for his guidance and support.

> *One of the most important contributions to the communication and information revolution has been the digital computer. Animated by elements of human creative genius, these machines are opening new avenues for recording, storing and transmitting human thought. New means of communication transcend words fixed on paper or images on film and permit authors to communicate creatively, adaptively and dynamically with their audience.*[1]

I. INTRODUCTION

There is ongoing debate as to whether computer software constitutes protected speech under the First Amendment.[2] Some have argued that the functional nature of software should act as a complete bar to First Amendment protection, while others have claimed that software has inherent First Amendment value. Although judicial review of federal encryption policy has drawn this debate to the forefront,[3] there are broader implications in finding that computer software possesses a cognizable speech interest. Such a finding could equip technology litigants with a constitutional shield against government regulation and, under some circumstances, limit the imposition of civil liability based on the publication or distribution of software.

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1. NAT'L COMM'N ON NEW TECHNOLOGICAL USES OF COPYRIGHTED WORKS, FINAL REPORT AND RECOMMENDATIONS (1978), *reprinted in* 5 COPYRIGHT, CONGRESS AND TECHNOLOGY: THE PUBLIC RECORD 1, 16–17 (Nicholas Henry ed., 1980) [hereinafter CONTU REPORT].

2. *See, e.g.*, Yvonne C. Ocrant, *A Constitutional Challenge to Encryption Export Regulations: Software is Speechless*, 48 DEPAUL L. REV. 503 (1998); James J. Carter, Comment, *The Devil and Daniel Bernstein: Constitutional Flaws and Practical Fallacies in the Encryption Export Controls*, 76 OR. L. REV. 981 (1997); Norman A. Crain, Commentary, Bernstein, Karn, *and* Junger: *Constitutional Challenges to Cryptographic Regulations*, 50 ALA. L. REV. 869 (1999); Katherine A. Moerke, Note, *Free Speech to a Machine? Encryption Software Source Code Is Not Constitutionally Protected "Speech" under the First Amendment*, 84 MINN. L. REV. 1007 (2000); Daniel R. Rua, Comment, *Cryptobabble: How Encryption Disputes are Shaping Free Speech for the New Millennium*, 24 N.C. J. INT'L L. & COM. REG. 125 (1998); R. Polk Wagner, Note, *The Medium is the Mistake: The Law of Software for the First Amendment*, 51 STAN. L. REV. 387 (1999).

3. *See generally* Junger v. Daley, 209 F.3d 481 (6th Cir. 2000); Universal City Studios v. Reimerdes, 82 F. Supp. 2d 211 (S.D.N.Y. 2000); Bernstein v. United States Dep't of Justice, 176 F.3d 1132 (9th Cir. 1999) [hereinafter *Bernstein IV*], *opinion withdrawn and reh'g en banc granted*, 192 F.3d 1308 (9th Cir. 1999); Karn v. United States Dep't of State, 925 F. Supp. 1 (D.D.C. 1996).

There are significant consequences in the determination of whether software is protected speech or merely utilitarian product. While the government may regulate utilitarian technology free of First Amendment concerns, the First Amendment places limitations on government regulation of speech. If software is found to be speech, then government regulations of software content could trigger strict judicial scrutiny of the regulations. Conversely, if software is found to be a utilitarian product, software regulations are permissible so long as only nominal First Amendment considerations are satisfied. Ultimately, the finding that software is pure speech rather than utilitarian product will often determine whether a government regulation of computer software will withstand constitutional scrutiny.

While it is well-established that computer software possesses a protectable *property* interest,[4] it is less clear whether it harbors a protectable *speech* interest. Computer software is unique in that it can claim First Amendment protection on two distinct levels. On one level, the object code of the software possesses First Amendment interest to the degree that it functions as a medium for otherwise protected expression. Simultaneously, the source code of the software is expressive in and of itself. Analyzing these two distinct levels of expression in light of traditional First Amendment jurisprudence yields two rational conclusions. First, government can regulate computer object code only to the extent that it may regulate traditional mediums such as the press; and second, it can regulate computer source code only to the extent that it may regulate other scientific and instructional literature.

To appreciate software's inherent speech interests, one must first understand basic principles of software design and construction. Part II of this article discusses these processes in detail.[5] Part III contains a careful analysis of the speech interest and examines important considerations, including the status of scientific speech under the First Amendment, the relevance of the chosen language of expression, the relationship between products and instructional literature, and the policies underlying unprotected speech.[6] Part IV addresses how courts should choose and apply the differing levels of scrutiny in balancing free speech interests against state interests in regulation.[7] Finally, Part V

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4. *See, e.g.*, Computer Assocs. Int'l, Inc. v. Altai, Inc., 982 F.2d 693, 702 (2d Cir. 1992) (citing 17 U.S.C. § 101) (stating that a computer program is protectable by copyright law); State Street Bank & Trust Co. v. Signature Fin. Group, Inc., 149 F.3d 1368, 1374–75 (Fed. Cir. 1998) (citing 35 U.S.C. § 101 (1994)) (stating that a computer program is protectable by patent law).
5. *See infra* Part II.
6. *See infra* Part III.
7. *See infra* Part IV.

concludes this article with a call for progressive adjudication in the technology arena.[8]

II. UNDERSTANDING THE SUBJECT MATTER

A. The Relationship Between Source Code, Object Code, and Hardware

A computer program is a way of writing that is new to the latter half of the twentieth century.[9] It consists of a set of instructions comprised of letters, numbers, and other symbols commonly associated with linguistic communication,[10] and the legal community widely accepts the concept that a computer program is a form of text.[11] Computer programs are drafted in formal language[12] and must be written so they are comprehensible to others trained in the language.[13] Although the language in which a computer program is written varies, the drafted instructions are commonly referred to as "source code."[14] The dominant view is that source code text is a form of literary work.[15]

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8. *See infra* Part V.

9. *See* CONTU REPORT, *supra* note 1, at 17.

10. *See* JOHN J. BORKING, THIRD PARTY PROTECTION OF SOFTWARE AND FIRMWARE 33 (1985); CONTU REPORT, *supra* note 1, at 17; *see also* 17 U.S.C. § 101 (1994) (defining a computer program as "a set of statements or instructions to be used directly or indirectly in a computer in order to bring about a certain result").

11. *See* Pamela Samuelson et al., *A Manifesto Concerning the Legal Protection of Computer Programs*, 94 COLUM. L. REV. 2308, 2316 (1994).

12. *See* Marci A. Hamilton & Ted Sabety, *Computer Science Concepts in Copyright Cases: The Path to a Coherent Law*, 10 HARV. J.L. & TECH. 239, 265 (1997).

13. *See* Hugh Brett & Lawrence Perry, *Introduction* to THE LEGAL PROTECTION OF COMPUTER SOFTWARE 1, 9 (Hugh Brett & Lawrence Perry eds., 1981). Only those specifically trained are capable of comprehending source code. *See Bernstein IV*, 176 F.3d at 1140. However, there are millions of people in the United States alone that are trained to comprehend written computer programs. *See* Roy G. Saltman, *Computer Science and Technology: Copyright in Computer-Readable Works: Policy Impacts of Technological Change* (1977), *reprinted in* 3 COPYRIGHT, CONGRESS AND TECHNOLOGY: THE PUBLIC RECORD 365, 415 (Nicholas Henry ed., 1980).

14. *See* Junger v. Daley, 8 F. Supp. 2d 708, 712 (N.D. Ohio 1998), *rev'd*, 209 F.3d 481 (6th Cir. 2000). Such languages include BASIC, FORTRAN, COBOL, C, Pascal, and Perl. *See id.*; *see also Bernstein IV*, 176 F.3d at 1140; Brett & Perry, *supra* note 13, at 7. The various languages used to draft source code are also known as "high-level languages." *See Junger*, 8 F. Supp. 2d at 712.

15. *See* Samuelson et al., *supra* note 11, at 2323–24. It is important to note that most scholarship treating source code as a literary work has done so in the context of a copyrightable *property* interest and not of a protectable *speech* interest. *See, e.g.*, Computer Assocs. Int'l, Inc. v. Altai, Inc., 982 F.2d 693, 701 (2d Cir. 1992) (citing 17 U.S.C. § 101).

Computer languages are similar to conventional language in that they are guided by sets of grammatical rules.[16] Moreover, the author of a computer program must follow syntactical, punctuational, and formatting requirements.[17] The source code may then be printed on paper or saved onto an electromagnetic medium such as a floppy disk or hard drive.[18] In this respect, source code text may be directly perceived and comprehended to the extent that the reader is fluent in the language.[19] Consequently, one aim of programming is to communicate information to those who read the source code.[20]

At the same time, a computer program is written to operate with a computer to create a result.[21] Since source code cannot be processed directly by the computer, it must first be translated by a compiler

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16. See Hamilton & Sabety, *supra* note 12, at 265 (citing JEAN-PAUL TREMBLAY & PAUL G. SORENSON, THE THEORY AND PRACTICE OF COMPILER WRITING 30–31 (1985)). Computer languages, however, are "context free." *Id.* at 265 (citing JOHN E. HOPCROFT & JEFFREY D. ULLMAN, INTRODUCTION TO AUTOMATA THEORY, LANGUAGES AND COMPUTATION 233 (1979)). While the sentences of a computer language have grammatical structure in that the relationships between "words" are defined, a computer program does not need to define the words to accomplish its purpose. *See id.* at 265. For example, consider the following analogy:

> [A]n English speaker, without knowing what a "smorg" is, nor what it is to "vit," can parse the silly sentence: "The smorg vitted the blag." First, we know where the sentence begins and ends, and using one grammatical rule, we decompose the sentence into a subject and an object phrase: "smorg" is the subject, and "vitted the blag" is the object phrase. We use another grammatical rule to decompose the object phrase into its constituent pieces: "vit" is the verb, and "blag" is the object. Thus, we have deduced the components of the sentence without understanding the meaning of the words. This sort of formalism makes computer languages work.

Id. at 265–66.

17. *See Bernstein IV*, 176 F.3d at 1140; *see also* Richard H. Stern, *Copyright in Computer Programming Languages*, 17 RUTGERS COMPUTER & TECH. L.J. 321, 327 (1991).

18. *See* CONTU REPORT, *supra* note 1, at 44–45. "A program is created . . . by placing symbols in a medium. In this respect [source code] is the same as a novel, poem, play, musical score, blueprint, advertisement or telephone directory." *Id.* at 28.

19. *See Bernstein IV*, 176 F.3d at 1140.

20. *See* Brett & Perry, *supra* note 13, at 9.

21. *See* Saltman, *supra* note 13, at 415. A representative for the National Commission on New Technological Uses of Copyrighted Works ("CONTU") has stated:

> [T]he point has been made that a computer program is a set of instructions for a machine, and in fact, according to this view, since the machine can not operate without the program, the program is really part of the machine. Thus programmers are really engaged in machine design, according to this argument[.]

Id.

program into "object code."[22] One primary distinction between source code and object code is that source code is intelligible to a reader, while object code is not.[23] Object code is nothing more than a long combination of 1's and 0's to be read by the computer, and it is what instructs the computer to execute specified tasks.[24] In actuality, the computer is controlled by strings of electric current, and the binary digits merely indicate whether the computer is implementing a high or low voltage.[25]

Object code is a product that is virtually interchangeable with hardware.[26] An electronic device can be connected to a computer to effectuate the same result that could have been induced by object code.[27] For example, integrated circuits are used to direct the manipulation of computer information and to perform logical functions.[28] These integrated circuits contain stored strings of high and low voltages called microcodes, which are extremely similar in nature to object codes.[29] Due

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22. *See* CONTU REPORT, *supra* note 1, at 57; Carter, *supra* note 2, at 997 (citing DONALD E. KNUTH, 1 THE ART OF COMPUTER PROGRAMMING 4–5 (2d ed. 1974)).

23. *See* Carter, *supra* note 2, at 997.

24. *See id.* (citing DONALD E. KNUTH, 1 THE ART OF COMPUTER PROGRAMMING 4–5 (2d ed. 1974)).

25. See ANDREW CHRISTIE, INTEGRATED CIRCUITS AND THEIR CONTENTS: INTERNATIONAL PROTECTION 13 n.23 (1995). Computers make decisions by using electronic logic. *See id.* at 12. Two voltage states, high and low, are used to manipulate small combinations of transistors called "gates." *See id.* at 12–13. The gates act as switches allowing or disallowing current to pass, depending on whether the voltage states have turned the switch "on" or "off." *See id.* at 13. Computers are able to perform their function by combining large numbers of gates. *See id.* While 0's and 1's are commonly referred to as object code, object code is really the program in "the form of a series of strings of low and high voltages." *Id.* at 204. While these voltages are stored as electromagnetic charges, they may be represented in any form perceivable by humans, such as 0's and 1's. *See id.* In other words, "a circuit is either on or off: there either is an electric signal or there is no electric signal. These two states are *represented* by the binary digits zero and one which are generally known as 'bits'." CHRISTOPHER J. MILLARD, LEGAL PROTECTION OF COMPUTER PROGRAMS AND DATA 11 (1985) (emphasis added).

26. See Samuelson et al., *supra* note 11, at 2320 (citing TERRENCE W. PRATT, PROGRAMMING LANGUAGES: DESIGN AND IMPLEMENTATION 19 (2d ed. 1984)). In principle, the utilitarian aspects of object code can be reproduced from basic electronic components such as AND gates, OR gates, transistors, etc. *See id.* at 2320 n.34. However, while hardware and software may be the "functional equivalents of one another," there are other factors such as cost that may make one construct advantageous over another. *See id.* at 2320.

27. *See id.* at 2320 (citing TERRENCE W. PRATT, PROGRAMMING LANGUAGES: DESIGN AND IMPLEMENTATION 19 (2d ed. 1984)).

28. *See* CHRISTIE, *supra* note 25, at 10.

29. *See id.* at 209. Microcode is usually much simpler than object code; that is, it performs more concrete functions and often executes only one task. *See id.* at 210.

to the interchangeability between hardware and object code, computer programs are often referred to as "virtual machines."[30]

B. Software Design and Program Behavior

Prior to drafting the source code, it is necessary for the programmer to determine the overall concept or purpose of the program.[31] Flow charts are then made to outline the program steps and to illustrate the manner in which the larger modules of the program are to operate together.[32] The source code is designed within the confines of the flow chart's logical structure to accomplish the overall purpose of the

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30. *See* Universal City Studios v. Reimerdes, 82 F. Supp. 2d 211, 222 n.30 (S.D.N.Y. 2000) (stating that courts have divided on whether program code is constitutionally protected and giving examples of sources arguing that "most executable software is best treated as a virtual machine" (quoting Mark A. Lemley & Eugene Volokh, *Freedom of Speech and Injunctions in Intellectual Property Cases*, 48 DUKE L.J. 147, 236–37 (1998))); *see also* Samuelson et al., *supra* note 11, at 2324. Consider the following conceptual analogy:

> Where physical machines are built from physical structures like gears, wires, and screws, programs are built from information structures, such as algorithms and data structures. In software, these components must work together in a very carefully orchestrated way that resembles nothing so much as an intricate mechanical device consisting of thousands of delicate gears and levers. In a mechanical device, the gear teeth must mesh exactly, and levers must move at just the right moments.

Id. at 2321.

31. *See* Brett & Perry, *supra* note 13, at 9 (explaining that "[t]he logical way to write a program is first to determine precisely the problem to be solved").

32. See CONTU REPORT, *supra* note 1, at 57; Brett & Perry, *supra* note 13, at 10. Generally, programming is done "from the general to the specific." Computer Assocs. Int'l, Inc. v. Altai, Inc., 982 F.2d 693, 697 (2d Cir. 1992) (quoting Whelan Assocs., Inc., v. Jaslow Dental Lab., Inc., 797 F.2d 1222, 1229 (3d Cir. 1986)). Flow charts are used to chart the interaction between sub-components that function interdependently. *See id.* (citing Mark T. Kretschmer, Note, *Copyright Protection for Software Architecture: Just Say No!*, 1988 COLUM. BUS. L. REV. 823, 826 (1988)). These sub-components are known as modules, and module interaction often depends on the modules having compatible parameters. *See id.* at 697–98.

program.[33] In designing the source code, programmers use their creative skills to select and arrange smaller, often public, compilations of code.[34]

The primary source of economic value in computer software is its capacity to induce computer behavior.[35] Software is intended to produce specific utilitarian results, and program behavior is far more important to the consumer than the "eloquence" of the source code.[36] However, there is independence between source code and program behavior, as demonstrated by the fact that identical behavior may be achieved by executing two completely different sets of source code.[37] Furthermore, in attempting to induce a certain computer behavior, the programmer will inevitably consider and combine the elements of individual style,

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33. *See* CONTU REPORT, *supra* note 1, at 57. Consider the following:

> Each stage of the development requires industrial design work: from identifying the constraints under which the program will operate, to listing the tasks to be performed (i.e. determining what behavior it should have), to deciding what component parts to utilize in bringing about this behavior (which in the case of software, includes algorithms and data structures), to integrating the component utilitarian elements in an efficient way.

Samuelson et al., *supra* note 11, at 2328 (citing STEERING COMM. FOR INTELLECTUAL PROP. ISSUES IN SOFTWARE, NAT'L RESEARCH COUNCIL, INTELLECTUAL PROPERTY ISSUES IN SOFTWARE 45–46 (1991)).

34. *See* Samuelson et al., *supra* note 11, at 2316 (stating that "the industrial designs embodied in programs are typically incremental in character, the result of software engineering techniques and a large body of practical know-how").

35. *See id.* at 2316–17. While source code is in fact text, it is different from ordinary text in that it makes computers perform tasks. *See id.*; *see also* CONTU REPORT, *supra* note 1, at 17 (stating that computer software consists of a set of instructions which are "used in an almost limitless number of ways to release human beings from such diverse mundane tasks as preparing payrolls, monitoring aircraft instruments, taking data readings and making calculations for research, setting type, operating assembly lines, and taking inventory").

36. *See* Samuelson et al., *supra* note 11, at 2317. For example, the value in a word processor is not in the articulate drafting of source code but in the tasks the source code helps the user perform. *See id.* (stating that "no one would buy a program that did not behave . . . no matter how elegant the source code 'prose'"). This is demonstrated in part by the fact that consumers do not generally receive a copy of the source code when they purchase software; they only receive the object code. *See id.* at 2318.

37. See *id.* at 2317 (comparing the similar behavior but different texts of VP-Planner and Lotus 1-2-3). The behavior of a program can be exactly copied without appropriating the text. *See id.* at 2318.

Traditionally, programmers rewrote "every line of code afresh," regardless of how common the subroutines or how large the program. *Id.* at 2322. By comparison, however, modern programming incorporates a technique often called "software reuse." *See* Telephone Interview with John F. Greco, Professor of Legal Issues in E-Security, New York University School of Law (Dec. 27, 2000) [hereinafter Interview with Professor Greco]. Software reuse is especially common in object-oriented programming and allows programmers to simply cut and paste lengthy portions of code from one program to another. *See id.*

efficiency, and know-how within the parameters of the subject technology.[38]

III. ASCERTAINING THE SPEECH INTEREST

Whether a subject matter contains protected speech is independent of whether that purported speech may be regulated.[39] Part III of this article first addresses the threshold inquiry of whether computer software is capable of harboring a speech interest.[40] As will be demonstrated, computer software possesses speech interests on two distinct levels: object code and source code.

A. The Medium of Object Code

There is a speech interest in object code to the degree that the object code acts as a medium for fixed speech.[41] This interest is not based on any inherent expressive value contained in the object code itself; it is based on the expressive value of the fixed content for which the object code acts as a conduit. The Supreme Court has recognized the validity of this interest in its liberal extension of First Amendment principles to the Internet.[42] In addition, some courts have indicated that video games might be capable of First Amendment protections as a result of their

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38. See BORKING, *supra* note 10, at 33–34 (stating that programming is an art requiring creativity and a degree of style); Samuelson et al., *supra* note 11, at 2329–30 (discussing how programming requires training, specialized skill, and knowledge of the specific programming language and host hardware).

39. *See* Wagner, *supra* note 2, at 389–90. When traditional spoken or written word is the subject matter of First Amendment analysis, the courts spend little time on the question of whether the subject matter is in fact expression envisioned by the First Amendment. *See id.* at 389. The threshold question, referred to as "relatively minor First Amendment doctrine," is the critical inquiry in ascertaining whether a government regulation is limited by principles of free speech. *See id.* at 389–90 (citing Robert Post, *Recuperating First Amendment Doctrine*, 47 STAN. L. REV. 1249, 1252 (1995)).

40. *See infra* Part III.

41. This is particularly relevant: not only is the government limited in its regulation of free speech, but to a degree it is limited in its regulation of the instrumentalities of free speech. *See, e.g.*, Minneapolis Star & Tribune Co. v. Minn. Comm'r of Revenue, 460 U.S. 575 (1983) (holding unconstitutional a tax on paper and ink because of its unreasonable burden on the freedom of the press); Joseph Burstyn, Inc. v. Wilson, 343 U.S. 495 (1952) (holding that the First Amendment limits the government's ability to regulate the distribution of film).

42. *See* ACLU v. Reno, 521 U.S. 844, 850 (1997) (observing that the Internet is a cognizable medium of human communication); *see also* Mainstream Loudoun v. Bd. of Trs. of the Loudoun County Library, 2 F. Supp. 2d 783, 793–94, 797 (E.D. Va. 1998) (analogizing the Internet to a set of encyclopedias and holding that a library's discretion to filter non-obscene materials from the Internet is limited by the First Amendment).

artistic audio-visual display.[43] Undoubtedly, computer programs that either entertain or instruct would also be considered speech, as the Supreme Court has consistently extended First Amendment protection to new mediums of communication.[44] Object code that serves as a medium for photographs, movies, music, and literature should not be considered less expressive simply because the medium is constructed of differentiated voltage states instead of traditional materials such as paper or film.

On the other hand, a set of object code that only commands the computer to execute an unseen function does not contain a fixed expressive element.[45] The execution of digital tasks that takes place "under the hood" of a computer is not perceivable by other humans, and thus could not possibly contain a communicative element under any of the three traditional theories of free speech.[46] Purely utilitarian object

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43. *See* Rothner v. City of Chicago, 929 F.2d 297, 30203 (7th Cir. 1991). The *Rothner* Court stated:

> We are aware that several district courts, ruling in a variety of factual contexts and upon requests for preliminary injunctions, have held that video games are not protected by the [F]irst [A]mendment. However, these cases do not hold that, under all circumstances, all video games can be characterized as completely devoid of any [F]irst [A]mendment protection. On the basis of the complaint alone, we cannot tell whether the video games can be characterized as simply modern day pinball machines or whether they are more sophisticated presentations involving storyline and plot that convey to the user a significant artistic message protected by the [F]irst [A]mendment. Nor is it clear whether these games may be considered works of art. To hold on this record that all video games no matter what their content – are completely devoid of artistic value would require us to make an assumption entirely unsupported by the record and perhaps totally at odds with reality.

Id. (citing America's Best Family Showplace Corp. v. City of New York, 536 F. Supp. 170 (E.D.N.Y. 1982), and Malden Amusement Co. v. City of Malden, 582 F. Supp. 297 (D. Mass. 1983)). For a discussion on the use of the First Amendment as a shield against municipal zoning of video games, see John E. Sullivan, Note, *First Amendment Protection of Artistic Entertainment: Toward Reasonable Municipal Regulation of Video Games*, 36 VAND. L. REV. 1223 (1983).

44. *See Reno*, 521 U.S. at 850 (applying principles of free speech to the Internet); Metromedia, Inc. v. City of San Diego, 453 U.S. 490, 501 (1981) (recognizing that billboards are expressive); FCC v. Pacifica, 438 U.S. 726, 744 (1978) (applying First Amendment principles to public broadcasting); *Burstyn*, 343 U.S. at 501–02 (extending First Amendment protection to film). As another matter, object code should not lose its First Amendment protection as a medium simply because it is often the subject of commercial transactions. *See id.* at 501 (stating that movies, books, magazines, etc. do not receive diminished protection as a result of being sold for profit).

45. For a discussion of the utilitarian nature of computer software, see *supra* notes 21–30 and accompanying text.

46. When faced with new forms of communication, it is common for the courts to

code is most akin to a virtual machine[47] and, generally speaking, may be regulated without regard to First Amendment limitations.[48] It should be observed, however, that there is one exception to this generalization. While purely utilitarian object code does not act as a medium for fixed expression, it might facilitate the creation or distribution of new speech by the user of the computer program. Examples might include the object codes of word processing, graphic design, and electronic mail programs. It is clear that there is some type of speech interest in paper and ink,[49] and the law should not distinguish object code simply because of an alternative machine design.

A conceptual problem presents itself when the execution of particular object code yields both a highly functional result and some measure of fixed expression.[50] In such a case, there is duality in that the

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ascertain whether protection for that communication will further one of the three underlying policies of free speech jurisprudence. *See* 1 RODNEY A. SMOLLA, SMOLLA AND NIMMER ON FREEDOM OF SPEECH § 2:3 (3d ed. 1996). The three theories addressing the value of speech are the "Marketplace of Ideas" theory, the "Human Dignity and Self-Fulfillment" theory, and the "Democratic Self-Governance" theory. *Id.*

The "Marketplace of Ideas" theory analogizes the uninhibited exchange of ideas to an open market. *Id.* § 2:4. The theory presupposes that the free exchange of competing ideas will eventually lead to some form of truth or enlightenment. *See id.* It is illogical and counterintuitive to advocate the view that object code in its *purely functional* capacity furthers the search for truth. Object code in its purely functional capacity does not express ideas to another person, let alone the metaphorical marketplace.

The "Human Dignity and Self-Fulfillment" theory sees value in speech not in its capacity to facilitate truth or public enlightenment, but in that self-expression is central to spiritual gratification. *Id.* § 2:5. In other words, the expression of one's self is an essential part of the human experience. *See id.* The protection of object code does not further the interest of this theory, because programmers do not express themselves by drafting object code; they draft source code. *See supra* Part II.

The "Democratic Self-Governance" theory values free speech in its capacity to facilitate democracy. SMOLLA, *supra*, § 2:6. The scope of speech that would be protected under this theory is limited, and such protection has traditionally extended to political debate or discussion of social policy. *See id.* This theory would not protect the purely functional capacities of object code.

47. For a comparison of software to gears, levers, and other physical machine components, see *supra* note 30 and accompanying text.

48. *See, e.g.*, Spence v. Washington, 418 U.S. 405, 409 (1974) (stating that it is necessary to first ascertain whether an activity is "sufficiently imbued with elements of communication" for the First Amendment to apply); Clark v. Community for Creative Non-Violence, 468 U.S. 288, 293 (1984) (stating that a First Amendment analysis begins with the inquiry of whether expressive conduct exists).

49. *See, e.g.*, Minneapolis Star & Tribune Co. v. Minn. Comm'r of Revenue, 460 U.S. 575 (1983) (holding unconstitutional a tax on paper and ink because of its unreasonable burden on the freedom of the press).

50. For example, a utilities program may include on-screen directions on how to use the program. While the utilities program is primarily functional in nature, the on-screen directions are a form of protected instructional literature.

object code simultaneously acts as medium and machine. This duality should not bar a finding of a speech interest; it should only limit the scope of the interest to the fixed expression communicated in the execution of the object code. In approaching ambiguous subject matter that walks the line between speech and function, the courts should follow judicial precedent and take a liberal approach that errs on the side of extending free speech protection.[51] Moreover, consistent application of the liberal approach will both safeguard constitutional freedom and minimize the occurrence of ad hoc adjudication.

In sum, computer object code harbors an inherent speech interest to the degree that it acts as a medium for fixed speech. Moreover, this speech interest is not diminished by the fact that the object code may simultaneously facilitate speech and execute utilitarian function. On the other hand, a presence of functionality absent a communication of fixed expression should bar First Amendment application, unless the functionality facilitates the creation or distribution of new speech by the user of the program. Finally, it is important to note that while functionality should not obscure the finding of a speech interest, such functionality may influence a finding of whether that interest may be regulated.[52]

B. Source Code as Speech

The greater debate has focused on whether source code falls within the scope of First Amendment protection. The stronger argument is that source code is best treated as fully-protected speech rather than potentially expressive conduct. As defined by existing First Amendment jurisprudence, source code should be considered a specialized scientific language that instructs programmers on how to accomplish a particular computerized task.[53] This speech interest in source code arises out of its ability to communicate written ideas from an author to an audience via print or electronic media.[54] Further, the interest is unrelated to the fact

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51. *See, e.g.*, Joseph Burstyn, Inc. v. Wilson, 343 U.S. 495, 501 (1952). In extending the scope of the First Amendment to film, the *Burstyn* Court observed that caution should be taken when the line between protected and unprotected expression is "too elusive." *Id.* (quoting Winters v. New York, 333 U.S. 507, 510 (1948)).

52. For example, the direct regulation of speech is treated differently than conduct regulations that have an indirect effect on speech. For a discussion on the regulation of the speech interest, see *infra* Part IV.

53. *See Bernstein IV*, 176 F.3d at 1147 (Bright, J., concurring) (stating that "the speech aspects of encryption source code represent communication between computer programmers"); *see also supra* notes 12–13 and accompanying text.

54. *See* Brett & Perry, *supra* note 13, at 9; *Bernstein IV*, 176 F.3d at 1140.

that source code is tangential to object code. This is because source code cannot execute digital tasks *on its own*; rather, it must first be compiled into object code.[55] Thus, it is not inappropriate to classify source code as detailed instructional literature. The conceptual problem arises from the fact that only the process of compiling separates such literature from its corresponding object code.

In ascertaining the speech interest, it is helpful to conceptualize source code as the convergence of scientific expression, alternative language, and instructional literature. All three types of speech possess expressive value under the First Amendment, and such value should not be considered lost simply because source code is a combination of the three. Moreover, source code should not be categorized as a form of speech deserving only diminished protection. To appreciate this analytical framework, it is necessary to have a basic understanding of the jurisprudence surrounding the converging subject matters and the policies underlying unprotected speech.

1. Scientific Expression under the First Amendment

The recognition that scientific speech has expressive value can be traced back to the period of the Enlightenment as well as to the drafting of the U.S. Constitution.[56] The Framers of the Constitution appreciated the societal benefits that result from the free exchange of scientific ideas,[57] and they ensured that the Constitution would contain multiple

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55. *See* CONTU REPORT, *supra* note 1, at 57; Carter, *supra* note 2, at 997 (citing DONALD E. KNUTH, 1 THE ART OF COMPUTER PROGRAMMING 4–5 (2d ed. 1974)).

56. *See generally* STEVEN GOLDBERG, CULTURE CLASH: LAW AND SCIENCE IN AMERICA 26–43 (1994). "Veneration of science was a central tenet of eighteenth-century Enlightenment thinking[,]" and it was believed that science was essential to the understanding of both politics and religion. *Id.* at 26 (citing PETER GAY, THE ENLIGHTENMENT: AN INTERPRETATION 126–66 (1969) and ERNST CASSIRER, THE PHILOSOPHY OF THE ENLIGHTENMENT 43–45 (1960)). Furthermore, Revolutionary-era Americans did not distinguish between science and politics when discussing public affairs. *See id.* at 26.

For example, David Rittenhouse, a member of the Pennsylvania General Assembly and the Pennsylvania Constitutional Convention, was regarded as a first-rank scientist in the field of astronomy. *See id.* at 26–27 (citing BROOK HINDLE, DAVID RITTENHOUSE (1964) and EDWARD FORD, DAVID RITTENHOUSE (1946)). He also provided scientific advice during the Revolutionary War and "served as first director of the U.S. Mint." *Id.* at 27. Benjamin Rush was another prominent politician of the time who was actively involved in science. *See id.* (citing BROOKE HINDLE, THE PURSUIT OF SCIENCE IN REVOLUTIONARY AMERICA 1735–1789 (1956)). As a physician, Rush made significant contributions in the fields of chemistry and medical theory, but as a politician, "[h]e inspired Thomas Paine to write *Common Sense*, attended the Continental Congress, and signed the Declaration of Independence." *Id.*

57. *See id.* Benjamin Franklin is the preeminent example of a man who helped

provisions designed to promote the advancement of science.[58] While this desire to create a hospitable environment for the development of the sciences is epitomized by the First Amendment,[59] it is also evident in the Weights and Measurements Clause,[60] the Patent and Copyright Clause,[61]

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dissolve the boundaries between science and politics. *See id.* (citing PETER GAY, THE ENLIGHTENMENT: A COMPREHENSIVE ANTHOLOGY 766 (1973) and I. BERNARD COHEN, FRANKLIN AND NEWTON 36–37 (1966)). Benjamin Franklin was both a prominent American ambassador and, simultaneously, one of the leading physicians in the world. *See id.* In addition to Franklin, many of the other Framers were actively involved in the sciences as well. *See id.* For example, James Madison was fascinated by natural history, and Alexander Hamilton studied chemistry, medicine, and mathematics. *See id.* (citing EDWARD M. BURNS, JAMES MADISON: THE PHILOSOPHER OF THE CONSTITUTION 24–25 (1968) and JAMES T. FLEXNER, THE YOUNG HAMILTON: A BIOGRAPHY 47, 62 (1978)). In addition, Thomas Jefferson was well known for his work in the fields of natural history, geography, and paleontology. *See id.* (citing EDWIN T. MARTIN, THOMAS JEFFERSON: SCIENTIST (1952)). Interestingly, in 1789, Thomas Jefferson drafted a letter to the Harvard College president, which stated:

> [Scientific research] is the work to which the young men, whom you are forming, should lay their hands. We have spent the prime of our lives in procuring them the precious blessing of liberty. Let them spend theirs in showing that it is the great parent of science and of virtue; and that a nation will be great in both always in proportion as it is free.

Id. at 28 (quoting 7 THE WRITINGS OF THOMAS JEFFERSON 329 (Andrew A. Lipscomb et al. eds., 1904)).

58. *See id.* at 31 (stating that certain constitutional clauses "virtually require government support of science, whereas others permit such support for a broad range of activities").

59. *See* James R. Ferguson, *Scientific and Technological Expression: A Problem in First Amendment Theory*, 16 HARV. C.R.-C.L. L. REV. 519, 544 (1981) (stating that there is "no meaningful basis" for distinguishing scientific expression from other types of speech "for purposes of [F]irst [A]mendment analysis"); GOLDBERG, *supra* note 56, at 31 (stating that "scientific speech receives the full protection of the speech and press clauses of the First Amendment").

60. *See* GOLDBERG, *supra* note 56, at 33. The Weights and Measurements Clause gives Congress the power "To coin Money, regulate the Value thereof, and of foreign Coin, and fix the Standard of Weights and Measures[.]" U.S. CONST. art. I, § 8, cl. 5. It was believed that the implementation of this power was highly scientific in nature. *See* GOLDBERG, *supra* note 56, at 33. For example, the U.S. Mint was initially headed by scientists for over half a century and the National Institute of Standards and Technology researched in the fields of computer science, mathematics, physics, and chemistry. *See id.* at 34 (citing REXMOND C. COCHRANE, MEASURES FOR PROGRESS 21–33 (1966)).

61. *See* GOLDBERG, *supra* note 56, at 34–35. The Patent and Copyright Clause states that Congress has the power "To promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their Respective Writings and Discoveries[.]" U.S. CONST. art. I, § 8, cl. 8. This clause was inserted into the Constitution to ensure that the federal government implemented an incentive system for scientific and artistic innovation. *See* GOLDBERG, *supra* note 56, at 34–35. However, this monopoly on speech is only afforded to the creator for a limited time, due to the burden that the monopoly places on the free speech of those not enjoying

and the Spending Power Clause.[62] While the precise "status" of scientific expression under the First Amendment has often evaded direct judicial review, a handful of cases clearly indicate the high value our legal system places on scientific expression.[63]

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the monopoly. *See generally* Melville B. Nimmer, *Does Copyright Abridge the First Amendment Guarantees of Free Speech and Press?*, 17 UCLA L. REV. 1180, 1195 (1970). For example, the Supreme Court has stated:

> The Congress in the exercise of the patent power may not overreach the restraints imposed by the stated constitutional purpose. Nor may it enlarge the patent monopoly without regard to the . . . social benefit gained thereby. Moreover, Congress may not authorize the issuance of patents whose effects are to remove existent knowledge from the public domain, or to restrict free access to materials already available.

Graham v. John Deere Co., 383 U.S. 1, 5–6 (1966). For further discussion concerning intellectual property law, see *infra* notes 92–93 and accompanying text.

62. *See generally* United States v. Butler, 297 U.S. 1 (1936). Congress has the power "[t]o lay and collect Taxes, Duties, Imposts and Excises, to pay the Debts and provide for the common Defence and general Welfare of the United States[.]" U.S. CONST. art. I, § 8, cl. 1. Consequently, Congress has the power to fund scientific research provided that it is in the "general welfare" to do so. *See Butler*, 297 U.S. at 65–67. For a discussion on the First Amendment implications of conditional federal funding and scientific research, see GOLDBERG, *supra* note 56, at 39–43.

It should be noted that the federal government has also supported the promotion of science as a part of its execution of the congressional power "to raise and support armies." *Id.* at 32–33 (quoting U.S. CONST. art. I, § 8, cl. 12). For example, the Revolutionary War demonstrated that science was an important part of the military effort, and West Point Academy, founded in 1794, was one of the first national scientific institutions in America. *See id.* at 32.

63. *See* Matthew B. Hsu, Note, *Banning Human Cloning: An Acceptable Limit on Scientific Inquiry or an Unconstitutional Restriction of Symbolic Speech?*, 87 GEO. L. J. 2399, 2406 (1999) (observing that the Supreme Court has yet to precisely define the "scope of the First Amendment protection to be given to science"). Surprisingly, it is the obscenity cases that contain the Supreme Court's most concrete indication that scientific expression has First Amendment value. *See id.* It is clearly established jurisprudence that speech is considered obscene and outside the scope of the First Amendment if it does not satisfy the test articulated in *Roth v. United States*, 354 U.S. 476 (1957), and later clarified and reaffirmed in *Miller v. California*, 413 U.S. 15 (1972):

> The basic guidelines for trier of fact must be: (a) whether "the average person, applying contemporary community standards" would find the work, taken as a whole, appeals to the prurient interest; (b) whether the work depicts or describes, in a patently offensive way, sexual conduct specifically defined by the applicable state law; and (c) whether the work, taken as a whole, lacks serious literary, artistic, political, or *scientific value*.

Miller, 413 U.S. at 24 (emphasis added) (citation omitted). The converse proposition to this test is that otherwise unprotected obscenity is "transformed" into protected expression when it contains some measure of scientific value. *See id.* at 22–23 (stating that the Court must be careful not to infringe on scientific expression); *see also* Hsu, *supra*, at 2406 n.66 (observing that a survey of obscenity law reveals that the judiciary recognizes value in

In addition, the categorization of source code as valuable expression is fully supported by the three underlying policies of the First Amendment.[64] First, the exchange of scientific information clearly implicates a speech interest under the "marketplace of ideas" theory.[65] An uninhibited marketplace of ideas is a requisite element in the pursuit of scientific "truth" and understanding, and many have analogized the marketplace theory to the scientific method.[66] The fact that peer review

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scientific expression). For example, the *Miller* Court expressly stated that a medical book used to educate physicians would clearly fall within the protection of the First Amendment. *Miller*, 413 U.S. at 26.

There are also a handful of cases that *presume* that scientific expression falls within the scope of free speech protections. For example, in the case of *Progressive v. United States*, the court assumed that there was a speech interest in a book that would publicly reveal information concerning the hydrogen bomb. Progressive, Inc. v. United States, 467 F. Supp. 990, 995 (W.D. Wis. 1979) (stating that "the question before the court is a basic confrontation between the First Amendment right to freedom of the press and national security"); *see also* Demuth Dev. Corp. v. Merck & Co., 432 F. Supp. 990, 993 (E.D.N.Y. 1977) (finding a speech interest in the publication of an encyclopedia of chemicals); Jones v. L.B. Lippincott Co., 694 F. Supp. 1216, 1217 (D. Md. 1988) (refusing to apply strict products liability standard to an instructional medical textbook because "to do so would chill expression and publication [in a manner] inconsistent with fundamental free speech principles").

64. *See* SMOLLA, *supra* note 46, § 2:3 (introducing the three classic free speech theories); Hsu, *supra* note 63, at 2406–07 (citing IRA H. CARMEN, CLONING AND THE CONSTITUTION 35 (1985)); Ferguson, *supra* note 59, at 543 (observing that "it is clear that a system of free scientific expression promotes each of the three major interests that the [Supreme Court] has identified as [F]irst [A]mendment concerns"). For a brief discussion of how the three theories of free speech apply to *object* code, see *supra* note 46.

65. *See* SMOLLA, *supra* note 46, § 2:4 (briefly describing the "marketplace of ideas" theory). The marketplace theory places social value on debate and the uninhibited search for truth. *See id.* § 2:19 (explaining that for proponents of the theory such as Holmes, "the benefit of the marketplace was not the end but the quest, not the market's capacity to arrive at final and ultimate truth, but rather the integrity of the *process*"). Under the marketplace theory, free speech is cherished in its *facilitative* capacity to "result in the discovery of ultimate truth." *Id.* § 2:18 (citing Red Lion Broad. Co. v. FCC, 395 U.S. 367, 390 (1969)). Scientific expression in particular has great value under the marketplace theory. *See* Ferguson, *supra* note 59, at 536 (stating that "scientific advances not only contribute to the collective wisdom of the culture, but also make possible practical applications that improve the quality of modern life").

66. *See* Gary L. Francione, *Experimentation and the Marketplace Theory of the First Amendment*, 136 U. PA. L. REV. 417, 427 (1987). One noted scholar has stated:

> [F]reedom of expression is an essential process for advancing knowledge and discovering truth. An individual who seeks knowledge and truth must hear all sides of the question, consider all alternatives, test his judgment by exposing it to opposition, and make full use of different minds. Discussion must be kept open no matter how certainly true an accepted opinion may seem to be; many of the most widely acknowledged truths have turned out to be erroneous.

THOMAS I. EMERSON, THE SYSTEM OF FREEDOM OF EXPRESSION 6–7 (Vintage Books

is a catalyst for the development of new ideas in computer science best demonstrates that source code is speech.[67] The drafting of the source code text is an incremental process, and knowledge of prior advances in the field is crucial to the creation of new code.[68]

Scientific expression constitutes protected speech under an alternative First Amendment doctrine, commonly referred to as the theory of "human dignity and self-fulfillment."[69] This theory is highly protective of an individual's interest in autonomy and gratification through expression, and it values self-expression regardless of communicative exchange or effect.[70] Scientific speech fits easily into

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1971) (1970). Professor Emerson believes that the marketplace theory of free speech is essentially structured like the scientific method since both value "'progress through free and rational inquiry.'" Francione, *supra*, at 427 (quoting Thomas I. Emerson, *Colonial Intentions and Current Realities of the First Amendment*, 125 U. PA. L. REV. 737, 741 (1977)). While the scientific method encourages the testing of scientific propositions, so too does the marketplace theory strive for a system where all facts and opinions are subject to criticism and opposition. *See id.*

67. *See* Hsu, *supra* note 63, at 2407. Putting scientific ideas into the marketplace allows such ideas to be tested and challenged, thereby leading to greater understanding of the subject matter. *See id.* Peer review is essential to scientific advancement in any field, and one commentator has observed:

> The advancement of knowledge . . . is the basic function of the scientific community. This is accomplished . . . through a high degree of open communication and free sharing of information. Indeed, the open character of science has proven to be essential for the advancement of knowledge and, concurrently, vital for the detection and elimination of error.

HAROLD C. RELYEA, SILENCING SCIENCE: NATIONAL SECURITY CONTROLS AND SCIENTIFIC COMMUNICATION 6 (1994); *see also* Ferguson, *supra* note 59, at 536–41 (describing ways in which a system of free scientific expression promotes the discovery of scientific truth).

In the field of computer science, much programming know-how is obtained by reading and writing for texts and trade journals. *See* Samuelson, *supra* note 11, at 2329–30. Because source code often caters to specific operating systems and hardware, most of these journals discuss programming at a general conceptual level. *See id.* Nevertheless, journals, texts, and industry conferences are essential to the continuing advancement of computer science. *See id* at 2329–32.

68. *See* Samuelson et al., *supra* note 11, at 2330–31. Programmers often weave existing elements of source code design into their own programs by applying old sections of code to new contexts. *See id.*; Interview with Professor Greco, *supra* note 37. Consequently, programmers are both beneficiaries and contributors to a "cumulative innovation process." Samuelson et al, *supra* note 11, at 2331.

69. *See generally* SMOLLA, *supra* note 46, § 2:5.

70. *See id.* While the marketplace theory values free speech as an indispensable *process*, free speech also possesses intrinsic value separate from the marketplace process. *See id.* Such value stems from the fact that free speech is "intimately intertwined with human autonomy and dignity." *Id.* § 2:21. As stated by the late Justice Thurgood Marshall, "[t]he First Amendment serves not only the needs of the polity but also those of the human spirit — a spirit that demands self-expression." *Id.* (quoting Procunier v.

this model of the First Amendment because such speech is the self-expression of an author's rational analysis of the surrounding world.[71] Moreover, source code squarely fits within the scope of this First Amendment theory, because source code is a creative text that embodies the programmer's understanding and quantification of principles of logic.[72]

Martinez, 416 U.S. 396, 427 (1974)). In other words, an individual has the freedom to speak what one thinks, simply because one thinks it. *See id.* This theory recognizes value in the self-gratifying nature of expression and advocates that First Amendment value suffers no detriment even if the speaker has no audience. *See id.* (citing Melville B. Nimmer, *The Right to Speak from Times to Time: First Amendment Theory Applied to Libel and Misapplied to Privacy*, 56 CAL. L. REV. 935 (1968)). Furthermore, it is established jurisprudence that the First Amendment protects the *"autonomous control over the development and expression of one's intellect*[.]" Doe v. Bolton, 410 U.S. 179, 211 (1973) (Douglas, J., concurring) (emphasis added).

71. *See* Ferguson, *supra* note 59, at 533 (stating that "scientific communications . . . represent the final product in a creative intellectual process"). In order to solve a problem, a scientist must engage in both critical and creative thought, and it is this process that affords the scientist with both personal and professional satisfaction. *See id.* at 534. It is also argued that many scientists self-actualize in the process of expressing themselves. *See* C. Edwin Baker, *Scope of the First Amendment Freedom of Speech*, 25 UCLA L. REV. 964, 990–96 (1978)). These "moment[s] of illumination" often trigger the creative process which leads to scientific innovation. Ferguson, *supra* note 59, at 534.

In addition, the dissemination of scientific ideas is equally critical to self-fulfillment, for one goal of the scientist is to make the world aware of her discovery. *See* Hsu, *supra* note 63, at 2407. In fact, a scientist's professional standing is directly proportional to the degree in which her discovery is known to her peers. *See id.* The value of such self-expression is not diminished by the presence of an economic incentive. *See* Va. Pharm. Bd. v. Va. Consumer Council, 425 U.S. 748, 761 (1976).

72. *See* Saltman, *supra* note 13, at 416; *see also* ANTHONY L. CLAPES, SOFTWARE, COPYRIGHT, AND COMPETITION: THE "LOOK AND FEEL" OF THE LAW 88 (1989) (stating that "[c]omputer programs seek out truth . . . the truth that is inherent in the programs' logic"). One commentator has observed the following:

> In effect, the computer program is an implementation of the view that the physical world and at least part of the human world is amenable to rational analysis and quantification, and to understanding deduced from these processes. Scientists, engineers, economists and statisticians must be listed among those whose core of professional work conforms to this view.

Saltman, *supra* note 13, at 416. Moreover, each individual computer program is a stylistic representation of an author's way to approach a logic problem. *See* CLAPES, *supra*, at 92. Style is mostly the product of training, imagination, and intellectual horsepower, but interestingly, there is a "Strunk and White" for drafting source code, entitled *Elements of Programming Style. See id.* One commentator has compared the art of computer programming to that of poetry stating that "[t]he programmer, like the poet, works only slightly removed from pure thought-stuff. He builds his castles in the air, from air, creating by exertion of the imagination. Few media of creation are so flexible, so easy to polish and rework, so readily capable of realizing grand conceptual structure." *Id.* at 43 (quoting F. P. BROOKS, THE MYTHICAL MAN-MONTH (1975)). For example, Judge Wiseman of the Middle District of Tennessee has stated that:

The third free speech theory places a value on expression because it facilitates democracy and self-government.[73] The legal community has long embraced the notion that free speech, political speech in particular, is necessary to the success of democratic government.[74] It should be noted, however, that scientific discovery has long been intertwined with the political process,[75] and the uninhibited expression of scientific information is often vital in making informed political decisions.[76] To

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> Throughout the preparation of a complicated computer program . . . the author is faced with a virtually endless series of decisions as to how to carry out the assigned task . . . . The author must decide how to break the assigned task into smaller tasks, each of which must in turn be broken down into successively smaller and more detailed tasks . . . . At every level, the process is characterized by choice, often made arbitrarily, and only occasionally guided by necessity. Even in the case of simple statistical calculations, there is room for variation, such as the order in which arithmetic operations are performed . . . . As the sophistication of the calculation increases, so does the opportunity for variation of expression.

Id. at 121 (quoting SAS Inst., Inc. v. S & H Computer Sys., Inc., 605 F. Supp. 816, 825 (M.D. Tenn. 1985)).

73. *See* SMOLLA, *supra* note 46, § 2:26. The right to free speech on issues concerning public affairs is essential in the intelligent exercise of an individual's right of citizenship. *See id.* § 2:27 (quoting THOMAS M. COOLEY, 2 CONSTITUTIONAL LIMITATIONS 886 (8th ed. 1927)). A principal tenant of democracy is that "everything worth saying shall be said." Ferguson, *supra* note 59, at 541 (quoting A. MEIKLEJOHN, FREE SPEECH AND ITS RELATION TO SELF-GOVERNMENT 26 (1948)). In fact, Justice Brandeis has stated that "freedom to think as you will and to speak as you think are means indispensable to the discovery and spread of political truth." SMOLLA, *supra* note 46, § 2:26 (quoting Whitney v. California, 274 U.S. 357, 375 (1927)).

74. *See* Landmark Communications, Inc. v. Virginia, 435 U.S. 829, 838 (1978) (stating that "a major purpose of [the First] Amendment was to protect the free discussion of government affairs"); *see also* Hsu, *supra* note 63, at 2407 (observing that many commentators believe that the First Amendment theory of self-governance is limited to political speech).

75. *See supra* notes 56–57 and accompanying text. The Continental Congress observed that freedom of speech is not limited to the discussion of politics and public affairs, but extends to expression concerned with the advancement of "truth, *science*, morality, and the arts in general." GOLDBERG, *supra* note 56, at 28–29 (quoting I JOURNALS OF THE CONTINENTAL CONGRESS 108 (1904)) (emphasis added). In fact, Thomas Jefferson once stated that "[s]cience is more important in a republican than in any other government." *Id.* at 28 (quoting 10 THE WRITINGS OF THOMAS JEFFERSON 141 (1904)).

76. *See* Ferguson, *supra* note 59, at 541–43. Many have argued that a free speech theory of self-governance requires absolute protection to both discussion on public affairs, as well as to science, the arts, philosophy, and literature. *See id.* at 542 (quoting A. MEIKLEJOHN, FREE SPEECH AND ITS RELATION TO SELF-GOVERNMENT 256–57 (1948)). Public discussion of scientific issues contributes to the individual's "capacity for sane and objective judgment." *Id.* Individuals must consider scientific information addressing the risks and benefits of certain political decisions. *See id.* at 543. For example, it is not

this end, the theory of self-governance places a high value on computer source code's potential role in political decision-making.[77]
Otherwise protectable speech does not lose its protection because it is scientific subject matter. A study of First Amendment theory demonstrates the speech interest in computer source code, and a study of the case law reveals a judicial tendency to value scientific expression. Furthermore, the courts should treat source code on an equal First Amendment footing with other scientific expression, because a refusal of protection would be an impermissible evaluation of content.[78]

2. Alternative Language as Speech

Just as source code does not fall outside the scope of the First Amendment because it is scientific expression, it does not lose its classification as "speech" simply because its ideas are communicated in a language other than English.[79] It is established jurisprudence that the individual possesses a fundamental constitutional right in one's choice of language,[80] and it is equally clear that the chosen language of the speaker does not alter the First Amendment status of otherwise protected speech.[81] In fact, it is the presence of language that defines subject

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practical to make political decisions regarding nuclear power without a basic understanding of the underlying technology. *See id.* The theory of self-governance would recognize such subject matter as harboring a cognizable speech interest. *See id.*

77. It is likely impossible to enumerate every governmental use of computer programs. The list might include encrypted government databases, digital weapons-control systems, and sophisticated economic spreadsheets, among other uses. Under the self-governance free speech theory, an individual would have a speech interest in the critical analysis of these programs. Whether this interest may be constitutionally regulated is a separate issue and for further discussion, see *infra* Part IV.

78. *See, e.g.*, Ward v. Rock Against Racism, 491 U.S. 781, 791 (stating that the government may not condition protection on the content of the message). For example, it seems ridiculous to think that the courts would find a speech interest in a medical textbook, but not in a book instructing one on how to draft a computer program. *See Miller*, 413 U.S. at 26.

79. For a review of the linguistic characteristics of source code, *see supra* notes 9–20 and accompanying text.

80. *See* Meyer v. Nebraska, 262 U.S. 390, 403 (1923).

81. *See* Arizonans for Official English v. Arizona, 69 F.3d 920, 934–36 (9th Cir. 1995), *rev'd*, 520 U.S. 43 (1997); Cal. Teachers Ass'n v. Davis, 64 F. Supp. 2d 945, 954 (C.D. Cal. 1999) (stating that "[t]he language of the proposition does not affect any speech protected by the First Amendment"); United States v. Serna-Vargas, 917 F. Supp. 711, 712 (C.D. Cal. 1996) (holding that "the government cannot single out English as having more exalted status among languages"); *see also* Office of Hawaiian Affairs v. Dep't. of Educ., 951 F. Supp. 1484 (D. Haw. 1996).

matter as "speech" and rescues it from classification as "expressive conduct."[82]

Source code is an alternate language used for the purposes of articulating ideas in a more precise manner than the English language permits.[83] Despite its arguable nexus with functionality,[84] source code

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82. *See Arizonans for Official English*, 69 F.3d at 934–35. In observing the difference between speech and conduct, the Court of Appeals for the Ninth Circuit stated the following:

> [We] are entirely unpersuaded by the comparison between speaking languages other than English and burning flags. Of course, speech in any language consists of the "expressive conduct" of vibrating one's vocal chords, moving one's mouth, or of putting pen to paper, or hand to keyboard. Yet the fact that such "conduct" is shaped by a language — that is, a sophisticated and complex system of understood meanings — is what makes it speech. *Language is by definition speech, and the regulation of any language is the regulation of speech.*

Id. (emphasis added). The distinction between "speech" and "expressive conduct" is very important in determining the appropriate way to balance the First Amendment interest against a government regulatory interest. *See infra* Part IV (discussing permissible regulations of the speech interest).

83. *See, e.g., Bernstein IV*, 176 F.3d at 1141 n.12. This principle is well-illustrated in comparing the use of the English language and the use of source code to communicate a method for finding the square root of a number:

> The square root of a number X is the number Y such that Y times Y equals X. This is declarative knowledge. It tells us something about square roots. But it doesn't tell us how to find a square root. In contrast, consider the following ancient algorithm, attributed to Heron of Alexandria, for approximating square roots: To approximate the square root of a positive number X: (1) Make a guess for the square root of X; (2) [c]ompute an improved guess as the average of the guess and X divided by the guess; [and] (3) [k]eep improving the guess until it is good enough. Heron's method doesn't say anything about what square roots are, but it does say how to approximate them. This is a piece of imperative "how to" knowledge. Computer science is in the business of formalizing imperative knowledge – developing formal notations and ways to reason and talk about methodology. Here is Heron's method formalized as a procedure in the notation of the Lisp computer language:
>
> ```
> (define (sqrtx)
> (define (good-enough? guess)
> (<(abs (-(square guess) x)) tolerance))
> (define (improve guess)
> (average guess (/ x guess)))
> (define (try guess)
> (if (good-enough? guess)
> guess
> (try (improve guess))))
> (try 1))
> ```

is a form of linguistic speech used to communicate ideas to other programmers.[85] Under existing jurisprudence, a programmer's choice to communicate scientific ideas using source code, rather than conventional or popular language, should not bar a finding of a pure speech interest in the communication.[86] In addition, the First Amendment should also protect the programmer's choice of which computer language to use in drafting the source code.[87] Moreover, a programmer's choice to express an idea in the form of source code, rather than a flow chart, for example, does not transform the speech interest into an interest in "expressive conduct."[88]

3. The Nexus Between Products and Instructional Literature

Although a programmer learns how to command a computer to accomplish a task when source code is read, this does not end the inquiry into whether source code is speech. A skilled professional can learn how to construct a material object by either reading appropriate instructional literature about the material object or by analyzing a physical sample of the material object. For example, a scientist may learn something by either *observing* an actual hydrogen bomb or by

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Id. (quoting Professor Harold Abelson of the Massachusetts Institute of Technology). Almost identical information is communicated from one programmer to another whether done with Heron's method or by use of the English language. *See id.* The only difference being that in source code form, the information communicates a method that both a programmer and a computer can understand. *See id.* at 1141.

84. It is the position of the author that source code is not functional in and of itself; it is the object code that is functional. *See infra* Part III.B.3 for further discussion.

85. *See supra* notes 12–13.

86. *See, e.g.*, Bernstein v. United States Dep't of State, 922 F. Supp. 1426, 1435 (N.D. Cal. 1996) [hereinafter *Bernstein I*] (stating that it makes no difference for First Amendment purposes whether an author chooses to communicate an idea in either English, French, German, or source code).

87. *See, e.g., Arizonans for Official English*, 69 F.3d at 935. For example, there is protected expression in a bilingual's choice to speak in one language over another, and the exercise of this choice does not impact the value of the speech. *See id.* The First Amendment also protects one's choice to linguistically convey information to another in a manner so that the listener can comprehend the speech's message. *See id.*

88. *See Bernstein IV*, 176 F.3d at 1143 n.18. In the case of *Bernstein IV*, the court held that an encryption program's source code is better classified as "speech" rather than "expressive conduct." *See id.* (stating that source code is text intended for human understanding and is no less speech than other scientific texts that communicate information); *see also Arizonans for Official English*, 69 F.3d at 935 (stating that variables such as "language, words, and wording . . . are simply among the communicative elements of speech"). *But see* Karn v. United States Dep't of State, 925 F. Supp. 1, 10 (D.D.C. 1996) (holding that the communication of source code is "expressive conduct").

reading instructional literature on how to build the bomb. This does not mean that there is a speech interest in the bomb itself simply because the observer could arguably get the same education from the physical model as from the book. In the context of source code, the single greatest theoretical difficulty is ascertaining whether source code is more properly conceptualized as instructional literature or as a physical model that has educational capabilities when observed by a skilled professional. This difference is crucial in ascertaining whether the communication of computer source code is "speech" in all contexts or whether it is merely capable of being "expressive conduct."[89]

The common argument is that computer source code is akin to a utilitarian machine, thereby negating any "pure" speech interest.[90] Advocates of this view would necessarily find that the communication of source code is still qualified for consideration as "expressive conduct" on an ad hoc basis, rather than being qualified for categorical classification as pure speech.[91] However, this argument fails to appropriately define the nexus between source code and the results obtained from the execution of its corresponding object code. It also fails to appreciate that the question of whether source code is speech is not whether source code is *speech or conduct*, but whether source code is *speech or electromagnetic machine*. Some have attempted to draw this line between speech and machine by utilizing principles of intellectual property law.[92] However, such analogies are flawed because the question of whether source code is cognizable property is an independent question of whether such property is metaphysical or concrete.[93]

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89. The answer to this question has significant impact on ascertaining the degree of judicial scrutiny that the government must satisfy in order to constitutionally regulate source code. *See infra* Part IV.

90. *See, e.g.*, *Bernstein IV*, 176 F.3d at 1147 (Nelson, J., dissenting) (stating that the basic function of encryption source code is to act as a method of controlling computers).

91. *See, e.g.*, *Junger*, 8 F. Supp. 2d at 715–18 (holding that encryption source code is not pure speech but, under certain circumstances, may be expressive conduct).

92. *See* Law Professors' Brief of Amicus Curiae for Appellee-Bernstein, U.S. v. Bernstein, 176 F.3d 1132 (9th Cir. 1999) (No. 97-16686), *reprinted in* Electronic Frontier Foundation, *Cryptography — Bernstein v. U.S.*, § IV (visited Dec. 12, 2000), *available at* http://eff.org/pub/Privacy/ITAR_export/Bernstein_case/Legal/971110_lawprofs.amicus [hereinafter *Brief of Amicus Curiae*] (stating that "the fact that copyright law affords protection to computer software based on its capacity for creative expression is at least implicative of the standards by which First Amendment protection is erected"); *Bernstein I*, 922 F. Supp. at 1436 (stating that while not dispositive, "copyright law does lend support to the conclusion that source code is a means of original expression").

93. *See* Wagner, *supra* note 2, at 404. Some have argued that because computer programs are copyrightable subject matter and copyright law protects the *expression* of

After careful analysis, it is apparent that a clear line may be drawn separating computer source code and object code into instructional literature and electromagnetic machine, respectively. In reaching this conclusion, it is helpful to review the value of instructional literature in the eyes of the First Amendment. There is a vast amount of jurisprudence in the field of products liability which presumes that instructional literature shares equal value with other types of speech.[94]

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ideas, then a computer program must be considered expression for the purposes of the First Amendment. *See id.* (citing *Bernstein I*, 922 F. Supp. at 1436). This argument erroneously presumes that the term expression has the same meaning in copyright jurisprudence as it does in First Amendment law. *See id.* While it is true that most copyrightable subject matter is speech (i.e. music, poetry, etc.), computer software is unique in that it is both copyrightable and patentable subject matter. *See supra* note 4. One commentators has observed the following:

> A computer program is sui generis. It is a written expression of the mind of its author, and is also the means which causes a highly complex machine to work. As such, many think it is too pure to merit protection under patent law and others think it too applied to be covered by copyright.

Lawrence Perry, *The World Intellectual Property Organization Model Provisions*, *in* THE LEGAL PROTECTION OF COMPUTER SOFTWARE 173, 173 (Hugh Brett and Lawrence Perry eds., 1981). Consequently, if we accept the argument that the presence of copyrightable subject matter mandates a finding of pure speech, we would be forced to accept the argument that the presence of patentable subject matter mandates a finding that the subject matter is merely a machine. Neither of these arguments, however, answer the question of whether the fixation of source code onto electromagnetic media is best classified as either an integrated virtual machine or an object divisible into electronic media and the instructional literature embedded upon it.

Interestingly, there are a number of cases that, for the purposes of products liability law, have decided the issue of whether software is a tangible product. For a general survey of such cases, see Jonathan B. Mintz, *Strict Liability for Commercial Intellect*, 41 CATH. U. L. REV. 617, 631 n.107 (1992); Michael C. Gemignani, *Product Liability & Software*, 8 RUTGERS COMPUTER & TECH. L. J. 173 (1981).

94. *See, e.g.*, Brandt v. The Weather Channel, 42 F. Supp. 2d 1344, 1346 (S.D. Fla. 1999) (holding that the Weather Channel was not responsible for harm resulting from an inaccurate weather broadcast because the imposition of liability would "chill well established [F]irst [A]mendment rights of . . . broadcasters"); Smith v. Linn, 563 A.2d 123, 127 (Pa. Super. Ct. 1989), *aff'd without opinion*, 587 A.2d 309 (Pa. 1991) (observing that a publisher has a First Amendment right to disseminate instructional literature on dieting); Jones v. J.B. Lippincott Co., 694 F. Supp. 1216, 1217 (D. Md. 1988) (stating that the extension of products liability law to publishers of instructional literature "could chill . . . expression and publication" and that to do so would be "inconsistent with fundamental free speech principles"); Walter v. Bauer, 88 A.D.2d 787, 787 (N.Y. App. Div. 1982) (observing that plaintiff did not state a cause of action in attempting to hold a publisher liable for harm caused to a child who followed the directions contained within the publisher's chemistry textbook); Cardozo v. True & Ellie's Book & Stationary, Inc., 342 So. 2d 1053, 1056 (Fla. Dist. Ct. App. 1977) (holding that a book retailer is not liable under a theory of implied warranty of merchantability if the consumer suffers harm resulting from inaccurate information contained within the book).

For example, courts have uniformly refused to hold publishers of instructional literature liable under products liability law due to the chilling effect that it would have on the First Amendment.[95] These cases recognize the notion that there is no such thing as a worthless idea under the First Amendment and that the communication of instructive information is within the scope of free speech protection.[96] Moreover, among this jurisprudence, there are two cases that together provide an analytical roadmap for making the determination of whether source code is instructional literature or merely a product.

First, in the case of *Winter v. Putnam*,[97] the defendant published a work entitled *The Encyclopedia of Mushrooms* that contained information intended to instruct readers on which wild mushrooms could safely be harvested for cooking.[98] Unfortunately, some of the information relating to the edibility of a species of mushroom was incorrect, and as a result, the plaintiffs ate poisonous mushrooms.[99] In refusing to hold the publisher liable for the inaccurate information, the court observed that instructional literature is protected free speech.[100]

By contrast, *Brocklesby v. United States* [101] was one in a series of cases that held that misleading aeronautical charts could form the basis for liability in a products liability action.[102] In *Brocklesby*, the court

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95. *See* Mintz, *supra* note 93, at 617 ("Courts have almost uniformly refused to classify written words or an idea as a 'product' for purposes of imposing the various forms of products liability."); *see also Smith*, 563 A.2d at 126 (stating that no appellate court has ever held a book to be a product for the purposes of § 402A of the Restatement of Torts); *Jones*, 694 F. Supp. at 1217 (observing that "no case has extended Section 402A to the dissemination of an idea or knowledge in books or other published materials").

96. *See* Winter v. G. P. Putnam's Sons, 938 F.2d 1033, 1035 (9th Cir. 1991). The Court of Appeals for the Ninth Circuit has stated that:

> Although there is always some appeal to the involuntary spreading of costs of injuries in any area, the costs in any comprehensive cost/benefit analysis would be quite different were strict liability applied to words and ideas. We place a high priority on the unfettered exchange of ideas. We accept the risk that words and ideas have wings we cannot clip and which carry them we know not where. The threat of liability without fault . . . could seriously inhibit those who wish to share thoughts and theories.

Id.

97. 938 F.2d 1033 (9th Cir. 1991).

98. *See id.* at 1034.

99. *See id.*

100. *See id.* at 1035.

101. 767 F.2d 1288 (9th Cir. 1985).

102. *See generally id.*; Saloomey v. Jeppesen & Co., 707 F.2d 671 (2d Cir. 1983); Aetna Cas. & Sur. Co. v. Jeppesen & Co., 642 F.2d 339 (9th Cir. 1981). In *Aetna*, for example, the aeronautical charts contained two graphic representations of the proper landing approach. *See Aetna*, 642 F.2d at 342. Despite the fact that the two

found that an aeronautical chart was a product *for the purposes of products liability law*;[103] however, it refrained from directly addressing the status of the charts under the First Amendment.[104] While *Brocklesby's* tort-based holding does not provide guidance as to the tangibility of subject matter, there is relevant dicta in the *Winter* decision that attempts to differentiate between the two holdings.[105]

In *Winter*, the court distinguished aeronautical charts from *The Encyclopedia of Mushrooms* on the basis that a chart is a depiction of technical data, best analogized to a compass.[106] The court observed that while an aeronautical chart is functional like a compass, the mushroom encyclopedia was better analogized to "a book on how to use a compass."[107] Interestingly, the court made an express reference to computer programs, stating that defective software is more analogous to a compass than to a book on how to use a compass.[108] Although the court opined that an encyclopedia is "pure thought and expression" while an aeronautical chart is like a "physical product," the court never defined these terms.[109]

Although it is helpful to apply this analogy in ascertaining whether source code is speech or electromagnetic machine, such application is not dispositive of the issue. It is important to understand that both *Winter* and *Brocklesby* merely defined the statutory term "product" for the limited purpose of interpreting the Restatement of Torts.[110] These

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representations were not drawn to scale with each other, both graphic representations were placed on the same chart. *See id.* This "side-by-side" representation caused confusion and formed the basis for finding the charts defective. *See id.*

103. *See Brocklesby*, 767 F.2d at 1294–95. The court's decision turned on tort principles of reliance and mass-production. *See id.* Other courts have found aeronautical charts to be products based on tort principles of duty and cost-spreading. *See, e.g.*, *Saloomey*, 707 F.2d at 676–77. Some scholars observe that the outcome of the aeronautical chart cases may have resulted from the fact that aeronautical charts invite reliance in the performance of inherently dangerous activities. *See* Joel Rothstein Wolfson, *Electronic Mass Information Providers and Section 552 of the Restatement (Second) of Torts: The First Amendment Casts a Long Shadow*, 29 RUTGERS. L.J. 67, 99 (1997); John A. Gray, *Strict Liability for the Dissemination of Dangerous Information?*, 82 L. LIBR. J. 497, 499, 514–15 (1990).

104. *See Brocklesby*, 767 F.2d at 1295 n.9. The *Brocklesby* court refused to hear the First Amendment argument, because the issue was not properly raised at trial. *See id.*

105. See Winter, 938 F.2d at 1035–36.

106. *See id.* at 1036.

107. *Id.*

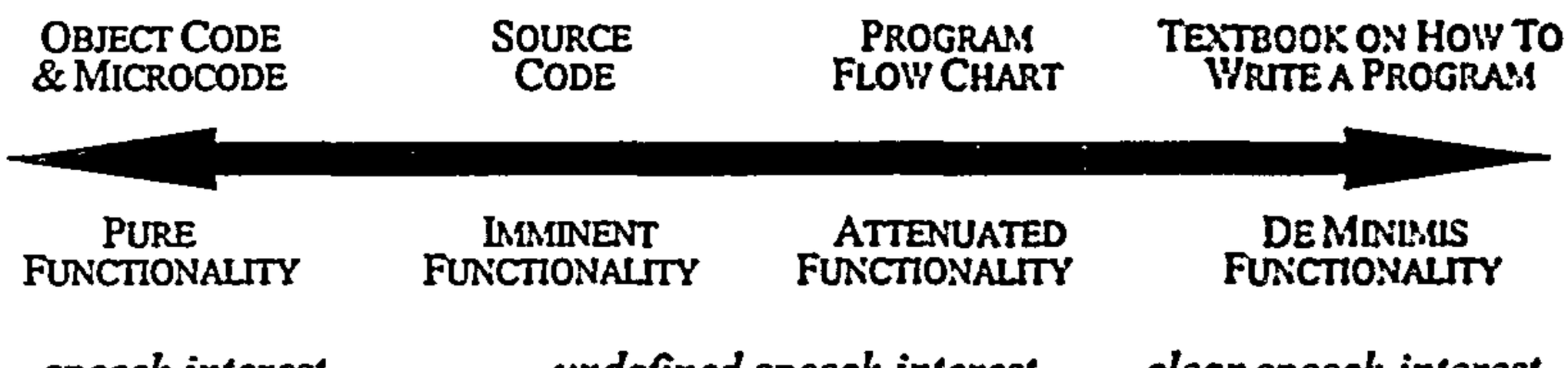
108. *See id.*

109. *Id.*; *see also* Robert B. Schultz, *Application of Strict Product Liability to Aeronautical Chart Publishers*, 64 J. AIR L. & COM. 431, 445–47 (1999).

110. *See Winter*, 938 F.2d at 1034 n.2–3 (citing Brooks v. Eugene Burger Mgmt. Corp., 215 Cal. App. 3d 1611, 1624–25 (1989)) (stating that the appropriate authority is the Restatement (Second) of Torts § 402A and comment d); *see also supra* note 103.

cases artfully avoid addressing the First Amendment question directly, as they were adjudicated based on statutory rather than constitutional principles.[111] Any direct analogy to these products liability cases would therefore be taken out of context because the scope of the First Amendment may only be defined by an exercise of the judiciary's exclusive power to interpret the Constitution.[112]

Nevertheless, the compass/chart dichotomy is a useful example in exploring the ultimate question of whether source code is pure speech or electromagnetic machine. However, while the analogy recognizes the appropriate question to ask, it does not provide the methodology for answering the question.[113] A sensible approach would be to first recognize that *all* instructional literature harbors the potential for functionality, even if only de minimis in degree.[114] Moreover, it should be noted that such functionality does not obscure a finding of pure speech.[115] For example, while an individual can easily transform source code into utilitarian object code, so too can the individual first learn from a textbook how to create object code and then later implement the knowledge. Such a textbook would certainly be considered pure speech under the First Amendment. Consider the following spectrum in which the ease of prospective functionality is proportionate to the degree of technical specificity of text:



111. *See supra* note 103.
112. *See generally* Marbury v. Madison, 5 U.S. 137 (1803).
113. Some scholars have attacked the compass/chart distinction as unreliable. *See, e.g.*, HENRY H. PERRITT, JR., LAW AND THE INFORMATION SUPERHIGHWAY 183 (1996) (stating that "[t]he reasoning and analogies used to support this treatment of charts is couched in conclusory languages that provides little analytical meat into which the courts can sink their judicial teeth").
114. *See Bernstein I*, 922 F. Supp. at 1435 (observing that instructions, how-to manuals, recipes, and even "technical information about hydrogen bomb construction" are functional in nature (quoting The Progressive, Inc. v. United States, 467 F. Supp. 990 (W.D. Wis. 1979))).
115. *See id.* (stating that "purely functional" literature is speech).

As illustrated, the primary difference between source code and an instructional textbook is the degree of ease by which the reader can transform acquired knowledge into the electromagnetic tangible known as object code.[116] One noted scholar, James Ferguson, has recognized the general difference in prospective functionality between scientific speech and *technical* scientific speech.[117] Ferguson properly observes that technical speech, as distinguished from other scientific speech, harbors a heightened potential to be easily transformed from intangible idea to material object.[118] Despite this finding, however, he advocates that technical expression such as source code harbors substantial social value and that its prospective functionality should not act as a bar to its categorization as speech.[119]

While there is a degree of human effort involved in transforming the instructions of a programming textbook into utilitarian object code, the same holds true for the transformation of source code. At first glimpse it may appear that source code is virtually interchangeable with object

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116. *See Brief of Amicus Curiae*, *supra* note 92, § II.C. Writing on behalf of a consortium of law professors, Professor Garrett Epps of the University of Oregon School of Law has stated the following:

> We recognize the ease with which information in the form of program code can be transformed into conduct. Further, the program code at issue here might actually propose such conduct. However, all speech with functional content enables and proposes conduct. The relative ease of that enablement has never been a factor in ascertaining the scope of First Amendment protection. Elementary cooking recipes are neither more nor less protected than sophisticated blueprints. The First Amendment has never depended upon a lack of functionality[.]

Id.

117. *See generally* Ferguson, *supra* note 59. Ferguson believes that technical specificity of scientific speech should not affect the question of whether the subject matter is protected speech, but that it is relevant in balancing the asserted government interest against the speech interest. *See id.* at 547.

118. *See* Ferguson, *supra* note 59, at 522–25. James Ferguson has observed that:

> In the case of scientific knowledge . . . the usually sharp distinction between the realm of ideas and the physical world of action does not always hold true. By revealing the explanations for the behavior of natural phenomena, scientific advances often confer the power to alter the conditions of everyday life in new and fundamental ways.

Id. at 525 (citing James R. Ferguson, *Scientific Inquiry and the First Amendment*, 64 CORNELL L. REV. 639, 641–42 (1979)).

119. *See* Ferguson, *supra* note 59, at 546–47. Although Ferguson acknowledges the functional capacity of encryption program source code, he also observes that encryption source code fills "an important social need for the secure encryption of computer information." *Id.* at 545. Outside the context of computer programs, Ferguson also observes the social value in such imminently functional speech as recombinant DNA maps. *See id.* at 546.

code; however, this is not the case. The source code must first be transformed into object code by a translator or compiler program.[120] Furthermore, this compiler program does not think on its own and is only capable of doing what it is programmed to do.[121] A compiler is merely an extension of human powers, or in other words, a helpful tool utilized by the user to aid in the efficient implementation of source code information.[122]

To use an analogy, it is self-evident that a textbook on how to build an engine would likely constitute protected pure speech. Moreover, the protected status of this textbook should not depend on whether the reader implements the textbook's information to manually build an engine or whether the same information is used to construct an assembly line that will build the engine more efficiently than the reader could have without any tools. Likewise, it is nonsensical to categorize source code as non-speech based on whether the reader manually converts source code information into electromagnetic voltage states or whether the reader utilizes the aid of the "compiler tool."[123]

The gap between object code and source code is an appropriate place to draw the line between utilitarian machine and instructional literature. To hold otherwise would be to introduce the problem of the "slippery slope," begging the question of where the appropriate place is to draw the line. If source code is not pure speech, then would a detailed program flow chart be speech?[124] To this end, would it matter how detailed or "technical" the flow chart is? Courts necessarily ascertain expressive conduct on an ad hoc basis. However, if a line is not drawn at the specific point separating instructional source code and functional

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120. *See Bernstein IV*, 176 F.3d at 1140 (stating that computers cannot make use of source code until it has been translated into "computer-executable object code").

121. *See* BORKING, *supra* note 10, at 33 ("A computer cannot think, but can only do what it has been instructed to do . . . .").

122. *See* MILLARD, *supra* note 25, at 26 n.51 (citing REPORT OF THE COMMITTEE TO CONSIDER THE LAW ON COPYRIGHT AND DESIGNS ¶ 514 (1977)) ("A very sophisticated tool it may be, with considerable powers to extend man's capabilities to create new works, but a tool nevertheless.").

123. *See* CONTU REPORT, *supra* note 1, at 17–18. Consider the following:

> The instructions that make up a computer program can be read, understood, and followed by a human being. For both economic and humanitarian reasons, it is undesirable for people to carry out manually the process described in painstaking detail in a computer program. Machines, lacking human attributes, cannot object to carrying out repetitious, boring, and tedious tasks.

Id.

124. *See* Brett & Perry, *supra* note 13, at 11. The step between a detailed flow chart and a fully coded program is small. *See id.* While the process involves a great degree of labor, it only requires nominal ingenuity. *See id.*

object code, then the courts will also have to ascertain the presence of pure speech on an ad hoc basis. This would appear to be an impermissible judicial inquiry into the content of the speech as there should be unitary First Amendment jurisprudence for all literature, regardless of its degree of technical specificity. Consequently, and for the purposes of First Amendment jurisprudence, the communication of computer source code is best treated as pure speech on a categorical basis rather than as expressive conduct on an ad hoc basis.

4. Unprotected Speech Jurisprudence and Computer Software

While it may be true that source code is pure speech, it is equally true that not all pure speech is protected under the First Amendment. Some categories of pure speech are either completely outside the scope of the First Amendment or are afforded a lower level of protection.[125] Such categories include, but are not limited to, obscenity,[126] child pornography,[127] incitement or fighting words,[128] defamation,[129] and commercial speech.[130] A study of the policies underlying existing categories of unprotected speech reveals that instructional speech, and source code in particular, should not be categorically excluded from First Amendment protection.

Unprotected speech shares a common thread in one or both of two ways. First, certain categories of unprotected speech are considered to be injurious (or imminently injurious) in the very utterance of the words.[131] For example, defamatory speech injures another's

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125. *See* Dun & Bradstreet, Inc. v. Greenmoss Builders, Inc., 472 U.S. 749, 758 (1985) (stating that "not all speech is of equal First Amendment importance").

126. *See* Miller v. California, 413 U.S. 15, 23 (1973) ("[It] has been categorically settled by the Court[] that obscene material is unprotected by the First Amendment."). For an articulation of the test defining obscenity, see *supra* note 63.

127. *See* New York v. Ferber, 458 U.S. 747, 762–63 (1982) (holding that child pornography has de minimis value and is a category of speech outside the scope of the First Amendment).

128. *See* Bradenburg v. State of Ohio, 395 U.S. 444, 447–48 (1969). Although a state may not punish mere abstract advocacy of lawlessness, the state may prohibit speech if it "is directed to inciting or producing imminent lawless action and is likely to incite or produce such action." *Id.* at 447.

129. *See Dun & Bradstreet*, 472 U.S. at 758–59 (holding that matters of private concern have lower constitutional value than those of public concern).

130. *See* Ohralik v. Ohio State Bar Association, 436 U.S. 447, 456 (1978) (holding that commercial speech deserves only a "limited measure of protection" because it possesses intermediate First Amendment value).

131. *See* Chaplinsky v. New Hampshire, 315 U.S. 568, 571–72 (1942). The *Chaplinsky* Court observed the following:

> There are certain well-defined and narrowly limited classes of

reputation,[132] while fighting words are inseparably linked to prospective violence.[133] The second rationale is that certain categories of speech contain negligible or diminished social value.[134] Obscene speech is the most obvious type of speech that lacks social value;[135] commercial speech, however, is also perceived as having a diminished, though cognizable, value to society.[136]

Source code is neither without redeeming social value nor injurious to the person, property, or liberty of another.[137] Source code, and instructional speech in general, play a vital part in society in teaching scientific information to their audiences.[138] These ideas contribute to advancements in computer science and are supported by the three First Amendment theories.[139] Furthermore, source code is not categorically injurious to either its intended audience or unknown third parties; it is merely linguistic communication.[140]

There are, however, some circumstances under which the government can regulate speech without regard to First Amendment considerations. In the criminal aiding and abetting context, conduct in the form of

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> speech, the prevention and punishment of which have never been thought to raise any Constitutional problem. These include the lewd and obscene, the profane, the libelous, and the insulting or "fighting" words — those which by their very utterance inflict injury or tend to incite an immediate breach of the peace.

Id.

132. *See* Milkovich v. Lorain Journal Co., 497 U.S. 1, 19–20 (1990) (stating that one's reputation is harmed by statements "provably false").

133. *See Chaplinsky*, 315 U.S. at 571–72 (stating that fighting words are categorically injurious or imminently injurious).

134. *See, e.g.*, Miller v. California, 413 U.S. 15 (1973).

135. *See id.* at 24.

136. *See* Ohralik v. Ohio State Bar Ass'n, 436 U.S. 447, 456 (1978).

137. Again, source code must be differentiated from object code. While object code has the capability to be injurious, source code merely instructs on how to construct a harmful device. The source code instructions themselves are not intrinsically harmful. *See supra* Parts II, III.B.3.

138. *See supra* Part III.B.1.

139. *See supra* Part III.B.1.

140. It should be observed that *technical* speech, as distinguished from other scientific speech, harbors an incredible amount of communicative power. *See* Ferguson, *supra* note 59, at 522–25. Because the law concerns itself with the imminence of harm caused by speech, it might be a relevant consideration that technical scientific data, such as source code, is particularly empowering. *See id.* Technical information has the ability to reveal natural phenomena to others so that they might have the ability to harness new technology. *See id.* Assuming arguendo that source code is empowering to a potentially ill-intentioned audience, the empowering nature should not be considered in ascertaining whether source code should be *categorically* unprotected. The empowering nature should go to the balancing of the government's interest against the First Amendment interest. For further discussion, see *infra* Part IV.A.

speech can constitute the basis for criminal or civil liability.[141] This doctrine of criminal law does not distinguish between speech and conduct, so long as the act of speaking is sufficiently imbued with the requisite level of *intent* to assist in the commission of a crime.[142] While literature has often escaped liability for incitement to "imminent lawless action,"[143] such subject matter may in fact be unprotected criminal speech if intended to further the commission of a crime.[144]

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141. *See* Brown v. Hartlage, 456 U.S. 45, 55 (1982) (stating that liability for criminal solicitation is not prevented by the First Amendment if the solicitation was accomplished by pure speech); Giboney v. Empire Storage & Ice Co., 336 U.S. 490, 498 (1949) (rejecting the notion that criminal conduct is immunized simply because the conduct was accomplished by pure speech).

142. *See* Freeman v. United States, 761 F.2d 549, 550 (9th Cir. 1985); *see also* MODEL PENAL CODE § 5.02 (2000) (stating that one can be held liable for aiding and abetting if he intentionally encourages another to engage in criminal conduct). The Court of Appeals for the Ninth Circuit has observed the following:

> [T]he First Amendment is quite irrelevant if the intent of the actor and the objective meaning of the words which are used are so close in time and purpose to a substantive evil as to become part of the ultimate crime itself; in such circumstances, speech becomes an integral part of the crime and a First Amendment defense is foreclosed even if the prosecution rests on words alone.

Freeman, 761 F.2d at 550. In the civil context, Judge Learned Hand has stated that the requisite level of intent for tort liability is merely that the criminal conduct is the "natural consequence[]" of the defendant's acts. United States v. Peoni, 100 F.2d 401, 402 (2d Cir. 1938).

143. Brandenburg v. Ohio, 395 U.S. 444, 447 (1969); *see also* Herceg v. Hustler Magazine, 814 F.2d 1017, 1022 (5th Cir. 1987) (stating that a publisher is immune to claims of incitement in the absence of *intent* to provoke *imminent* lawless action) (citing Hess v. Indiana, 414 U.S. 105, 109 (1973))). In *Herceg*, a thirteen-year-old boy read a Hustler magazine article describing, in detail, autoerotic asphyxia. *See id.* at 1018. Although the article was accompanied by warning and disclaimer, the child died when he engaged in this practice. *See id.* at 1018–19. The court postured that even if autoerotic asphyxia was a crime, there was no evidence to indicate that Hustler intended that readers engage in the technique, nor was there a finding that a reader would likely try the technique. *See id.* at 1022.

In another case, a child committed suicide after listening to the Ozzy Osbourne song "Suicide Solution." *See* McCollum v. CBS, Inc., 202 Cal. App. 3d 989 (1988). The plaintiff claimed that the record company was responsible for the death of the child because the song lyrics advocated suicide. *See id.* at 994. The court found that there was neither an intent to induce the crime of suicide, nor a likelihood that a listener would actually be inspired to commit the crime. *See id.* at 1000–01. Furthermore, the court noted that "[s]peech directed to action at some indefinite time in the future will not satisfy the [First Amendment incitement] test." *Id.* at 1000 (citing *Hess*, 414 U.S at 108).

144. *See, e.g.*, United States v. Barnett, 667 F.2d 835, 843 (9th Cir. 1982) (stating that the First Amendment is not a defense to criminal aiding and abetting liability when one publishes a book on how to produce illegal drugs).

For example, in *Rice v. Paladin Enterprises, Inc.*,[145] the defendant had published instructional literature on how to commit murder and evade police detection.[146] A reader of the book murdered someone in a fashion identical to the methods advocated in the book.[147] Based on the specific language of the text and the surrounding circumstances, the Court of Appeals for the Fifth Circuit applied the criminal aiding and abetting doctrine to hold the publisher liable for assisting in the murder.[148] In fact, one scholar advocates the view that *Rice* created a new category of unprotected speech for "instruction manuals that teach criminal conduct."[149]

While source code should be considered protected speech, the criminal aiding and abetting doctrine might limit the circumstances under which source code would be subject to First Amendment protection.[150] As an example, consider the case of source code whose

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145. 128 F.3d 233 (4th Cir. 1997).

146. *See id.* at 235–39 (quoting at length from HIT MAN: A TECHNICAL MANUAL FOR INDEPENDENT CONTRACTORS (Peter C. Lund ed.).

147. *See id.* at 239 (stating that the reader "meticulously followed countless of 'Hit Man's' 130 pages of detailed factual instructions on how to murder and to become a professional killer"). The *Rice* opinion details over a dozen ways in which the reader implemented the author's recommendations. *See id.* at 239–41.

148. *See id.* at 250 (holding that "the First Amendment does not pose a bar to [a] plaintiff's civil aiding and abetting cause of action"). The *Rice* court first recognized that the First Amendment is not a defense to criminal aiding and abetting simply because the culpable conduct was in the form of speech. *See id.* at 243–47. The court then observed that speech may be punished if it is intended to facilitate unlawful conduct and such conduct is likely. *See id.* at 248 (quoting DEPARTMENT OF JUSTICE, REPORT ON THE AVAILABILITY OF BOMBMAKING INFORMATION, THE EXTENT TO WHICH ITS DISSEMINATION IS CONTROLLED BY FEDERAL LAW, AND THE EXTENT TO WHICH SUCH DISSEMINATION MAY BE SUBJECT TO REGULATION CONSISTENT WITH THE FIRST AMENDMENT OF THE UNITED STATES CONSTITUTION 42–43 (1997)). The court agreed with the Department of Justice in that

> the government may punish publication of dangerous instructional information where that publication is motivated by a desire to facilitate the unlawful [conduct as to which the instructions inform, or] [a]t the very least, publication with such an improper intent should not be constitutionally protected where it is foreseeable that the publication will be used for criminal purposes . . . .

Id. Finally, the court found that the book was more than theoretical advocacy of an idea. *See id.* at 249. The text taught the techniques for violence and had detailed instructions for the commission of murder. *See id.*

149. Isaac Molnar, *Resurrecting the Bad Tendency Test to Combat Instructional Speech: Militias Beware*, 59 OHIO ST. L.J. 1333, 1362 (1998).

150. *See* United States v. Mendelsohn, 896 F.2d 1183, 1185 (9th Cir. 1990) ("The question is not whether the . . . computer program is speech, but whether it is protected speech." (citing Freeman v. United States, 761 F.2d 549, 552 (9th Cir. 1985))). In *Mendelsohn*, the court imposed criminal aiding and abetting liability on the defendants for selling a computer program that would be used in furtherance of an illegal gambling

corresponding object is purely functional and does not act as a conduit for contemporaneous expression.[151] Working within the analytical framework proposed by this article, such object code may be regulated without First Amendment limitations.[152] If the legislature criminalizes the possession or creation of such object code, the question arises whether the mere distribution of the corresponding source code is probative evidence of an intent to assist in the criminal creation and possession of the object code. In other words, assuming that the particular object code in question is purely functional and non-expressive, can someone distribute the corresponding source code without fear of breaking the criminal aiding and abetting law?[153] Circumstances indicating the use of source code for research purposes should clearly rebut any inference of criminal intent. In the case of mass distribution, however, the circumstances might certainly lead to the inference that the distributor intended that the readers use the source code in the creation of prohibited object code. For these reasons, government prohibitions of purely functional object code may have the

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operation. *See id.* at 1184 (affirming defendants' convictions for "aiding and abetting the interstate transportation of wagering paraphernalia, in violation of 18 U.S.C. §§ 371, 1953"). The defendants argued that the program was "an instruction manual for a computer" and that the imposition of criminal liability would be an unconstitutional burden on free speech. *See id.* at 1185. The court did not directly address whether computer software was in fact speech; it stated, however, that even if software were speech, the First Amendment does not place an obstacle to the imposition of criminal aiding and abetting liability. *See id.* at 1186. The court stated:

> Although a computer program under other circumstances might warrant [F]irst [A]mendment protection, [this program] does not. [This software] is too instrumental in and intertwined with the performance of criminal activity to retain [F]irst [A]mendment protection. No [F]irst [A]mendment defense need be permitted when words are more than advocacy, "so close in time and purpose to a substantive evil as to become part of the crime itself."

Id. at 1186 (citing *Freeman*, 761 F.2d at 552). It should be noted that the court did not mention whether the defendant had transported object code or source code. *See generally id.*

151. *See supra* Part III.A.

152. *See supra* Part III.A.

153. The *Rice* defendant expressed concern over the chilling effect that the court's opinion would have on the future distribution of questionable literature. *See Rice*, 128 F.3d at 265. In response, the court remarked that it is only in the "rarest case" that a court should find the requisite level of intent and that it was rarer still that intent would be judged as a matter of law. *Id.* The court also observed that the inference of an unlawful motive would almost never be reasonable if there was a lawful, legitimate purpose for the speech and when the context tends to negate the inference of an improper purpose. *See id.* at 266. Moreover, the court opined that political, educational, informational, and entertainment purposes would likely constitute legitimate purposes. *See id.*

de facto effect of removing the corresponding source code from the scope of First Amendment protections.

IV. PERMISSIBLE REGULATION OF THE SPEECH INTEREST

A. Countervailing Interests and Levels of Judicial Scrutiny

The freedom of speech is not absolute.[154] Communication that is both pure speech and outside the scope of an unprotected category may still be regulated by the government subject to limitation.[155] While probing analysis is required to appreciate fully that source code is a form of protected speech, there is already a well-established methodology for ascertaining whether protected speech may be the subject of government regulation. Once confident that some object code is a medium for protected speech and that most source code is protected instructional speech,[156] one can then ascertain how the government is constitutionally limited in its regulation of computer software.[157]

In the face of a government regulation affecting speech, the courts generally balance the government interest in regulation against the speaker's interest in communication.[158] The courts will give varying levels of deference to these two considerations, depending on the nature of the regulation and the particular communication.[159] For example, a high degree of deference is given to the government when it either regulates the time, place, and manner of speech[160] or when it regulates

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154. *See* Dennis v. United States, 341 U.S. 494, 581 (1951) (Douglas, J., dissenting) ("The freedom to speak is not absolute . . . .").

155. *See, e.g.*, Simon & Schuster, Inc. v. Members of the N.Y. State Crime Victims Bd., 502 U.S. 105, 124–28 (1991) (Kennedy, J., concurring) (observing that a balancing test applies to speech that is outside one of the traditional categories of unprotected speech).

156. *See supra* Part III.

157. *See supra* note 39 and accompanying text (observing that the subject matter of regulation must first be categorized as speech before it is necessary to question further whether the regulation unconstitutionally burdens freedom of speech).

158. *See* Am. Comm. Ass'n v. Douds, 339 U.S. 382, 399 (1950) (holding that conflicting interests should be balanced in light of the particular circumstances of the limitation on speech); *see also Dennis*, 341 U.S. at 524–25 (Frankfurter, J., concurring).

159. *See* SMOLLA, *supra* note 46, § 2:55 ("The 'ad hoc balancing' methodology is quite simple: In any conflict between free speech and other social values, the weight of the speech interest is balanced against the weight of the competing interest, on a case-by-case basis, and the conflict is resolved under a straightforward cost-benefit analysis.").

160. *See* Ward v. Rock Against Racism, 491 U.S. 781, 791 (1989); *see also* SMOLLA, *supra* note 46, § 3:1 (stating that regulations which are not based upon the content of speech qualify for less rigorous scrutiny). While the government cannot regulate *what* people say, it can regulate *when* and *where* it is said. *See Ward*, 491 U.S. at 791. According to the *Ward* Court:

conduct that merely has an "incidental impact" on speech.[161] On the other hand, a government regulation of speech that is aimed at the specific content of the speech is presumptively invalid and reviewed with strict judicial scrutiny.[162]

The question of whether source code is speech or an electromagnetic machine is of enormous consequence because of the resulting effect on the application of these varying levels of scrutiny. For example, if source code were merely considered an electromagnetic machine, then the government would be able to regulate the creation, distribution, and use of such machines so long as minimal First Amendment concerns were satisfied.[163] When we approach source code as pure speech, however, government regulations based on the subject matter of the

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> [T]he government may impose reasonable restrictions on the time, place, or manner of protected speech, provided the restrictions are justified without reference to the content of the regulated speech, that they are narrowly tailored to serve a significant governmental interest, and that they leave open ample alternative channels for communication of the information.

Id.

161. United States v. O'Brien, 391 U.S. 367, 376 (1968) (observing that incidental limitations on speech are permitted when conduct is comprised of both "nonspeech" and "speech" elements and the government has an important interest in regulating the nonspeech elements); *see also* SMOLLA, *supra* note 46, § 9:1 (stating that the guidelines set by *O'Brien* are generally not considered to be an exacting standard). The *O'Brien* Court defined the methodology for reviewing the constitutionality of conduct-based regulations as follows:

> [A] government regulation [of nonspeech conduct] is sufficiently justified if it is within the constitutional power of the [g]overnment; if it furthers an important or substantial governmental interest; if the governmental interest is unrelated to the suppression of free expression; and if the incidental restriction on alleged First Amendment freedoms is no greater than is essential to the furtherance of that interest.

O'Brien, 391 U.S. at 377.

162. *See, e.g.*, Simon & Schuster, Inc. v. Members of the N.Y. State Crime Victims Bd., 502 U.S. 105, 115 (stating that a statute is presumptively invalid if it places a financial burden on speech based on the content of the speech). In order to withstand strict scrutiny, the regulation must be both in furtherance of a compelling state interest and narrowly tailored to the furtherance of that interest. *See id.* at 120–21. Moreover, it need not be demonstrated that the government had an *intent* to discriminate for the regulation to be held unconstitutional. *See Ward*, 491 U.S. at 791 (citing Renton v. Playtime Theatres, Inc., 475 U.S. 41, 47–48 (1986)) (stating that the controlling consideration is whether the *purpose* of the regulation is to suppress certain expressive content).

163. *See supra* note 161 (articulating the *O'Brien* standard for the regulation of conduct that has incidental expressive value). Technology such as computer software may be regulated by state and local governments under their police power and by the federal government under the Commerce Clause. *See* GOLDBERG, *supra* note 56, at 84–86 (citing U.S. CONST. art. I, § 8, cl. 3).

source code become content-specific regulations of speech subject to the high standards of strict scrutiny.[164] The finding that computer software is speech will have a determinative effect on whether software may ultimately be a permissible subject of government regulation.[165]

B. Current and Prospective Regulations of Computer Software

Government regulation of computer software arises in many contexts, and legislators must take due care in articulating the law. While it may be acceptable to regulate utilitarian object code under certain circumstances, the government cannot constitutionally regulate the corresponding source code absent satisfaction of strict judicial scrutiny. This standard would apply any time the object of the government regulation is a specific type of source code. Interestingly, there are a number of situations in which existing laws would trigger the strict scrutiny standard upon challenge.

The most publicized issue concerning the First Amendment status of computer software relates to the federal export restrictions on encryption technology.[166] Encryption is the science of encoding and decoding communications in a manner that ensures that only authorized persons can access the communication.[167] Restrictions on the export of

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164. The virtual prohibition on content-based regulation applies to both the general topic of the speech as well as the particular viewpoint of the speaker. *See* Baugh v. Judicial Inquiry and Review Comm'n, 907 F.2d 440, 443–44 (4th Cir. 1990) (quoting Members of the City Council of L.A. v. Taxpayers for Vincent, 466 U.S. 789, 804 (1984)). Thus, in the case of computer software, it appears that a regulation would trigger strict scrutiny if it singles out either broad categories of source code or a programmer's individual way of expressing a certain type of program. Interestingly, absent independent creation, copyright law prohibits individuals from drafting source code that is substantially similar to the source code of another. *See generally* Computer Assocs. Int'l, Inc. v. Altai, Inc., 982 F.2d 693 (2d Cir. 1992). While the Copyright Act might be a content-specific regulation, copyright law is a constitutional mandate, and it is widely accepted that the Copyright Clause may permissibly burden the First Amendment. *See generally* Nimmer, *supra* note 61.

165. *See* Wagner, *supra* note 2, at 390 (citing R.A.V. v. St. Paul, 505 U.S. 377, 395–96 (1992) ("A 'strict scrutiny' standard, in most cases, will be the death knell for the regulation at issue.")).

166. For a survey of scholarly literature on the subject, see *supra* note 2. The export restrictions required a government-issued license for (1) Internet publication of encryption source code; (2) foreign publication of encryption source code via other electronic media such as a disk; and (3) foreign publication of encryption source code in a print medium that could easily be "scanned." *See Bernstein IV*, 176 F.3d at 1137–38 (citing 15 C.F.R. §§ 734.2(b)(9)(B)(ii), 734.3(b) (1999)).

167. *See id.* The *Bernstein* court understood encryption source code to be as follows: "Encryption basically involves running a readable message known as 'plaintext' through a computer program that translates the message according to an equation or algorithm into unreadable 'ciphertext.' Decryption is the translation back into plaintext when the

encryption technology reflect the government's fear that national security would be compromised if domestic scientists were allowed to share encryption source code with members of foreign nations.[168] Plaintiffs in three separate federal actions argued that the restrictions were an impermissible content-specific regulation of speech,[169] but the government argued that the restrictions were merely a constitutional regulation of one's ability to distribute particular utilitarian technology.[170]

While the circuit courts of two separate jurisdictions have held that source code is speech,[171] the district court of another jurisdiction has held that the export of source code might only be considered expressive conduct.[172] These two different approaches triggered the application of

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message is received by someone with an appropriate 'key.'" *Id.* at 1137 (quoting U.S. v. Bernstein, 974 F. Supp. 1288, 1292 (N.D. Cal. 1997)). Encryption technology is also used for ensuring the integrity of data, user authentication, and other applications. *See id.*

168. *See id.* at 1137. One high-ranking member of the State Department has stated:

> Policies concerning the export control of cryptographic products are based on the fact that the proliferation of such products will make it easier for foreign intelligence targets to deny the United States Government access to information vital to national security interests. Cryptographic products and software have military and intelligence applications. As demonstrated throughout history, encryption has been used to conceal foreign military communications, on the battlefield, aboard ships and submarines, or in other military settings. Encryption is also used to conceal other foreign communications that have foreign policy and national security significance for the United States. For example, encryption can be used to conceal communications of terrorists, drug smugglers, or others intent on taking hostile action against U.S. facilities, personnel, or security interests.

Id. (citations omitted). It should be noted that domestic speech intended for a foreign audience is entitled to equal protection with speech that will be both articulated and perceived domestically. *See id.* at 1139 n.9 (citing Bullfrog Films, Inc. v. Wick, 847 F.2d 502, 509 n.9 (9th Cir. 1988)).

169. *See* Junger v. Daley, 8 F. Supp. 2d 708, 711 (N.D. Ohio 1998), *rev'd*, 209 F.3d 481 (6th Cir. 2000); *Bernstein IV*, 176 F.3d at 1136; Karn v. United States Dep't of State, 925 F. Supp. 1, 9 (D.D.C. 1996).

170. *See Junger*, 209 F.3d at 482–84; *Bernstein IV*, 176 F.3d at 1141–42; *Karn*, 925 F. Supp. at 10–11.

171. *See Junger*, 209 F.3d at 485 ("Because computer source code is an expressive means for the exchange of information and ideas about computer programming, we hold that it is protected by the First Amendment."); *Bernstein IV*, 176 F.3d at 1141 (concluding that source code used by "those in the field of cryptography" has inherent value under the First Amendment and is entitled to protection under the prior restraint doctrine).

172. *See Karn*, 925 F. Supp. at 10 (holding that the encryption export regulations are conduct-based, rather than speech-based). In *Karn*, the court took the position that the regulations were conduct-based because such was the regulatory purpose articulated by the government and because the judiciary must defer to the stated intent of a government

varying levels of constitutional scrutiny. Predictably, those courts that held that software was pure speech utilized a high degree of scrutiny to ascertain when the regulations of encryption source code could be impermissible regulations of speech.[173] The district court that held that software was merely a utilitarian machine applied a low level of scrutiny to ascertain that the encryption software export restrictions were permissible regulations of conduct that only had an incidental impact on the First Amendment.[174]

These three cases demonstrate the impact of source code's First Amendment classification on whether the government can single out certain categories of source code for regulation. While these opinions recognize source code's value as instructional scientific text, they fail to clearly define source code's nature as literature. Instead of properly approaching source code as facilitating the prospective functionality of utilitarian object code, the courts have generally viewed source code as being functional in and of itself.[175] Until the courts fully appreciate that source code is not intrinsically functional on its own, it is likely that the courts will continue to apply incorrectly the varying levels of scrutiny.

The question of whether source code is speech has also come up in the context of recent copyright jurisprudence. Signed into law in

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agency in ascertaining the intent of the regulation. *See id.* at 9–10. This reasoning is flawed because the court failed to appreciate that a regulation should be judged not by its intent but by its ability to be "justified without reference to the content of the regulated speech." Ward v. Rock Against Racism, 491 U.S. 781, 791 (1988). While it appears that the government feared source code's ease of prospective functionality as instructional literature, the government did not make this content-neutral argument. *See Karn*, 925 F. Supp. at 9–10. The government, as well as the court, treated source code as being an intrinsically functional device, rather than instructional literature that may encourage prospective functionality. *See id.* at 11 (collectively referring to the diskette medium and its source code as an "article").

173. *See Bernstein IV*, 176 F.3d at 1145 (refusing to opine whether the regulations were content- or conduct-based, but finding that source code had a close enough nexus with expression in order to find the presence of a prior restraint). In *Junger*, however, the court oddly cited the *O'Brien* intermediate scrutiny standard for conduct regulations that incidentally impact expression, while simultaneously articulating what appeared to be a strict scrutiny standard. *See Junger*, 209 F.3d at 484–85 (citing U.S. v. O'Brien, 391 U.S. 367, 377 (1968) (referring to the encryption export restrictions as a "regulation of *speech*") (emphasis added)). The *Junger* court remanded the case to the district court to adjudicate the dispute in light of the fact that the government had amended the export regulations. *See id.* at 485.

174. *See Karn*, 925 F. Supp. at 11 (citing *O'Brien*, 391 U.S. at 377) (applying the *O'Brien* standard for conduct regulations that have an incidental impact on expression).

175. *See Junger*, 209 F.3d at 485 (referring to the "functional capabilities of source code"); *Bernstein IV*, 176 F.3d at 1142 (observing that source code has a "unique functional aspect"); *Karn*, 925 F. Supp. at 10 (observing that while source code comments may be protected by the First Amendment, the rest of the source code is "merely a means of commanding a computer to perform a function").

October 1998, the Digital Millennium Copyright Act ("DMCA") prohibits the circumvention of technologies designed to protect copyrighted works.[176] In the case of *Universal City Studios v. Reimerdes*,[177] the defendants had published on the Internet an encryption program that could be used to circumvent technologies designed to prevent the unauthorized copying of Digital Video Discs.[178] In his defense, Reimerdes argued that the DMCA was unconstitutional in that it prohibited the public dissemination of speech.[179]

The court, assuming arguendo that source code is speech, held that any alleged encroachment on the defendant's First Amendment rights was tolerable because speech used in the course of criminal conduct is not within the scope of First Amendment protection.[180] Relying on a statutory safe harbor for those engaging in good faith encryption

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176. *See* 17 U.S.C. §§ 1201–1205 (West 2000). In relevant part, the DMCA states the following:

> No person shall manufacture, import, offer to the public, provide, or otherwise traffic in any technology, product, service, device, component, or part thereof, that: (A) is primarily designed or produced for the purpose of circumventing a technological measure that effectively controls access to a work protected under [the Copyright Act]; (B) has only limited commercially significant purpose or use other than to circumvent a technological measure that effectively controls access to a work protected under [the Copyright Act]; or (C) is marketed by that person or another acting in concert with that person with that person's knowledge for use in circumventing a technological measure that effectively controls access to a work protected under [the Copyright Act].

Id. § 1201(a)(2).

177. 82 F. Supp. 2d 211 (S.D.N.Y. 2000) (issued in conjunction with a grant of the plaintiff's motion for summary judgment). The court issued an opinion in conjunction with its final judgment subsequent to completion of this article. *See* Universal City Studios v. Reimerdes, 111 F. Supp. 2d 294 (S.D.N.Y. 2000). While this article does not address the final opinion in *Reimerdes*, the opinion does not disturb the analytical foundation supporting the arguments presented in this article.

178. *See Reimerdes*, 82 F. Supp. 2d at 214.

179. *See id.* at 219.

180. *See id.* at 222–23. The court also held that the First Amendment could tolerate encroachments that further the constitutional policies of the Copyright Clause. *See id.* at 220. While the DMCA is not akin to traditional copyright law in that it fails to define the scope of the copyright, the DMCA is a "prophylactic measure" intended to protect against unauthorized access to copyrighted works. *Id.* Consequently, the court held that the DMCA was a constitutional furtherance of the copyright law under the Necessary and Proper Clause of the Constitution. *See id.* at 221 (citing McCulloch v. Maryland, 17 U.S. 316 (1819)). The court balanced the interest in preventing copyright infringement against the defendants' speech interests to find that the First Amendment would permit encroachment upon the defendant's alleged speech. *See id.* at 221–22 (citing MELVILLE B. NIMMER & DAVID NIMMER, 1 NIMMER ON COPYRIGHT § 1.10 (1999)).

research,[181] the court found that the defendant likely possessed an intent to aid in the substantive crime of circumvention.[182] Furthermore, the court opined that since the alleged speech was an inseparable part of a criminal conduct, the First Amendment would not immunize the communication of source code information.[183]

While Judge Kaplan's analysis in *Reimerdes* should be applauded for its proper application of aiding and abetting law to the computer software context, the precedential value of the opinion must be limited to circumstances in which the court finds wrongful intent on the part of the defendant. Although the language of the DMCA properly permits liability when there is a finding of wrongful intent, it improperly permits liability in alternative situations in which a finding of wrongful intent is not required.[184] For example, it is a violation of the DMCA to distribute source code that possesses negligible commercial purpose outside of circumventing technologies designed to protect copyrighted works.[185] It appears that the underlying logic of this provision erroneously overlooks the notion that an absence of commercial value cannot be equated with an absence of First Amendment value. If a plaintiff attempted to utilize this provision against a defendant who lacked culpable intent, it is not unlikely that the provision would be found to violate the First Amendment. Working within the analytical framework proposed by this article, it is simply impermissible to permit content-based liability for the distribution of source code absent either the satisfaction of the strict scrutiny standard or a finding of intent to facilitate the commission of an independent, substantive crime.[186]

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181. *See id.* at 218–19 (quoting 17 U.S.C. § 1201(g)(4)). The DMCA expressly states the following:

> [I]t is not a violation . . . for a person to (A) develop and employ technological means to circumvent a technological measure for the sole purpose of that person performing the acts of good faith encryption research . . . ; and (B) provide the technological means to another person with whom he or she is working collaboratively for the purpose of conducting the acts of good faith encryption research . . . or for the purpose of having that other person verify his or her acts of good faith encryption research . . . .

17 U.S.C. § 1201(g)(4)).

182. *See Reimerdes*, 82 F. Supp. 2d at 218–19. ("It appears that [the software] is being distributed in a manner specifically intended to facilitate copyright infringement.").

183. *See id.*

184. *See* 17 U.S.C. § 1201(a)(2), *supra* note 176 (quoting § 1201(a)(2)). It is important to note that the DMCA embodies a *disjunctive* test for liability. *See id.* The statute permits liability in one of three ways, one of which does not require a finding of intent. *See id.* The statutory language of another basis for liability is unclear as to the object of the intent requirement. *See id.*

185. *See id.*

186. For a discussion on source code and aiding and abetting law, see *supra* Part

While these encryption and circumvention disputes may have forced the courts to address the constitutionality of content-based software regulations, it is likely that courts will have to address the issue in other contexts. The application of the strict scrutiny standard for content-based regulations of computer software brings into question the constitutionality of a number of yet unchallenged statutes and regulations. Consider, for example, the proposed Uniform Computer Information Transactions Act ("UCITA"), a new commercial code designed to govern transactions in computer information such as source code.[187] While UCITA exempts both the motion picture and sound recording industries,[188] other entertainment industries remain within its scope.[189] Consequently, some entertainment and educational products will be governed by UCITA while others will remain within the scope of the Uniform Commercial Code ("UCC"). When taken together, the UCC and UCITA constitute a collective legislative scheme that differentiates software on the basis of content. In the event a litigant challenges the constitutionality of this legislative scheme, it is not unlikely that a court would review the content differentiation with strict judicial scrutiny.[190]

III.B.4.

187. *See generally* Uniform Computer Information Transactions Act (2000), *available at* The National Conference of Commissioners on Uniform State Laws, *Drafts of Uniform and Model Acts*, http://www.law.upenn.edu/bll/ulc/ulc_frame.htm (last visited Nov. 19, 2000) [hereinafter *UCITA Draft*]. This new commercial code is intended to govern commercial transactions where the subject matter is primarily information. *See id.* §§ 103(a)–(b). As compared to Article II of the Uniform Commercial Code, UCITA generally treats such transactions as licenses of intellectual property rather than a sale of goods. *See, e.g., id.* § 209 (discussing mass-market licenses).

UCITA has already been adopted in Virginia, and the Maryland legislature has taken quick action toward adoption. *See generally* VA. CODE ANN. §§ 59.1-501.1 to -509.2 (Michie 2000); S. 3, 2000 Leg., 414th Sess. (Md. 2000). Legislative consideration of UCITA is also pending in Delaware, Hawaii, and New Jersey; legislative action has come to a standstill, however, in California, Iowa, Illinois, Maine, and Oklahoma. *See New Media*, 20 COMMS. DAILY, Mar. 31, 2000, *available in* 2000 WL 4694931.

188. *See UCITA Draft*, *supra* note 187, §§ 103(d)(3)(A)–(B) (stating that UCITA does not apply to information transactions involving sound recordings, motion pictures, musical works, phonorecords, or audiovisual programming that is routed via satellite, broadcast, cable, or other similar method); *see also* VA. CODE ANN. §§ 59.1-501.3(b)(2), -501.3(d)(2).

189. *See, e.g., UCITA Draft*, *supra* note 187, § 103 cmts. 2, 3 (observing that "digital multimedia works" are within the scope of UCITA and that magazines, newspapers, and books might be within the scope of UCITA in their electronic, non-print form).

190. While the combined regulatory scheme of UCITA and the UCC may not differentiate speech on the basis of the view of the speaker, it treats different subjects of instructional literature differently. Transactions involving source code are treated as a license under UCITA, while the purchase of a map is still considered a sale of goods under the UCC.

V. CONCLUSION

Future regulation of computer software must account for software's inherent speech interest. While the government may regulate purely utilitarian object code that it views as harmful, such legislation must allow for the open exchange of the object code's corresponding source code. For example, many state governments have enacted computer trespass statutes to deter the unauthorized infusion of viruses into another computer.[191] While these may be lawful executions of a state's police power, the states cannot go so far as to prohibit the dissemination of the virus's source code, absent satisfaction of strict constitutional scrutiny.[192] While such viruses may be harmful to others, the source code is instructional speech that possesses educational value, and such regulation should trigger the application of a high level of constitutional review.

While only used as an example, the virus hypothetical illustrates the close proximity between permissible and impermissible legislation. There are numerous foreseeable ways in which regulation might trigger strict constitutional scrutiny,[193] and the government must take due care to avoid the suppression of free speech. As technology becomes increasingly integrated into everyday life, it is crucial for our jurisprudence to recognize the parallel evolution of the First Amendment. In fact, recognizing the need for progressive adjudication, one federal appellate judge has formally urged the Supreme Court to review the First Amendment issues underlying the encryption export restrictions.[194]

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191. *See* Michael Hatcher et al., *Computer Crimes*, 36 AM. CRIM. L. REV. 397, 427–28 (1999) (surveying the types of computer crime addressed by state law).

192. Of course, the government can prohibit the distribution of a virus's source code to the extent that the distributor has an intent to aid in the criminal creation of object code.

193. For example, electronic media might be free from discriminatory taxation. The Supreme Court has held that the imposition of a use tax on paper and ink is an unconstitutional burden on freedom of the press. *See* Minneapolis Star and Tribune Co. v. Minn. Comm'r of Revenue, 460 U.S. 575 (1983). An analogy could be applied to prevent the imposition from use taxes on electronic media. *But see* Karn v. United States Dep't of State, 925 F. Supp. 1, 9 n.18 (D.D.C. 1996) (stating that *Minneapolis Star* does not stand for the proposition that the government cannot regulate "tools of speech" such as computer disks but failing to state whether *Minneapolis Star* bars *discriminatory* regulation of the "tools of speech").

194. *See Bernstein IV*, 176 F.3d at 1147 (Bright, J., concurring). Judge Bright of the Court of Appeals for the Ninth Circuit stated the following:

> I join [the majority's] opinion. I do so because the speech aspects of encryption source code represent communication between computer programmers. I do, however, recognize the validity of [the dissent's] view that encryption source code also has the

The threshold question of whether computer software is protected speech is the greatest hurdle in ascertaining the degree to which the government may regulate computer software. In order to address the issue properly, however, one must appreciate that software possesses two overlapping First Amendment identities. Software in source code form is protected speech in that it is instructional speech that may be stored on electronic or conventional medium. At the same time, software in object code form, while often times purely utilitarian, harbors the potential to act as a medium for contemporaneous expression such as a communicative audio-visual display. It is not until after this duality is recognized that one can then apply First Amendment methodology to test the constitutionality of a given regulation.

The government may regulate utilitarian object code based on its function without First Amendment concerns; the government may not, however, regulate the corresponding source code on the same basis without satisfying strict scrutiny. A regulation of instructional literature aimed at the topic of instruction is clearly a content-based regulation that must be narrowly tailored to advance a compelling governmental interest. This proposition remains unaffected by the fact that source code information can be used to create utilitarian object code, which itself can be regulated. The ease with which a student can act on a lesson has never been relevant in the eyes of First Amendment jurisprudence.

It is difficult, if not impossible, to predict how the future of technology will impact the way we conceptualize freedom of speech. The parameters of contemporary First Amendment jurisprudence, however, mandate that all protected speech should be treated equally, regardless of content. Moreover, the increasing utility of technology should not be allowed to obscure protection for otherwise valuable expression. With these principles in mind, the judiciary should proceed cautiously so as to avoid suppressing the very freedom it is empowered to protect.

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functional purpose of controlling computers and in that regard does not command protection under the First Amendment. The importance of this case suggests that it may be appropriate for review by the United States Supreme Court.

Id.