GOOGLE GLASS: A PREEMPTIVE LOOK AT PRIVACY CONCERNS

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I. INTRODUCTION

It is undeniable that we all live in a world surrounded by technology. Indeed, recent reports have shown that 90% of Americans own some type of computerized gadget.[1] While many of us have come to embrace—whether willingly or not—the use of technology and gadgets in our everyday lives, we often fail to realize the full impact it causes. This type of technology has provided us with many benefits, such as having a wireless phone; e-mail on the go; and the ability to search a vast amount of knowledge via the Internet with the push of a button on a device we carry in our pocket.[2]

With these benefits, however, come potential drawbacks. Some of these harms are social, e.g., being connected to others at all times of the day. For example, friends, family, and even employers expect others to

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1. Amy Gahran, *Report: 90% of Americans Own a Computerized Gadget*, CNN (Feb. 3, 2011, 5:52 PM), http://articles.cnn.com/2011-02-03/tech/texting.photos.gahran_1_cell-phone-landline-tech-gadget?_s=PM:TECH.

2. Ironically, much of this ability is used for searching for "grumpy cats," YouTube videos, and the like.

be constantly available for a phone call or to answer an e-mail. Other harms affect us on a more personal, private level. These types of privacy harms have been the center of recent debates, including the debate on Do Not Track, and such harms are often hard to detect and identify. One reason for this difficulty is that the general public often does not understand the technology and its potential uses. This lack of understanding makes it difficult to be fully aware of what information is being used. If the public cannot even identify the personal information that they are giving up, it becomes especially challenging for them to determine whether their privacy has been violated.[3] This problem is exacerbated as technology continues to advance, leaving more and more people with a lack of sufficient technical knowledge. For these reasons, this paper looks to identify the potential privacy harms that may arise from the use of the upcoming advanced augmented-reality technology, Google Glass.[4] By identifying these potential harms now, we may be able to start the conversation and debate on these particular privacy concerns before any potential harm actually occurs.[5]

II. A FRAMEWORK FOR IDENTIFYING POTENTIAL HARMS

Privacy is a value that people have wanted to protect for a long time, but because of opposite desires based on curiosity, man's inquisitive nature, and a fear of the unknown, privacy protection has always faced challenges.[6] As this battle has grown and technology has advanced, the difficulty in concisely explaining the situation has become increasingly difficult. Fortunately, Professor Harry Surden[7] has provided

3. Notably, in Professor Annie Antón's recent presentation at the Silicon Flatiron's Technology of Privacy Conference (January 2013), she posited that, based on empirical evidence, consumers' top privacy concerns and values did not change over the six years between 2002 and 2008, despite drastic changes in technology. Annie Anton, Privacy Values and Privacy by Design, Presentation Before the Silicon Flatirons Technology of Privacy Conference (Jan. 11, 2013), *available at* http://www.siliconflatirons.com/documents/conferences/2013.01.11%20Privacy/Anton_PrivacyConf2013.pdf.

4. *See, e.g.*, *Google Glass*, GOOGLE+, https://plus.google.com/+GoogleGlass/posts (last visited Sept. 29, 2013); *Google Glass*, Mashable, http://mashable.com/category/project-glass (last visited Sept. 29, 2013).

5. In comparison, the current Do Not Track debate has been ongoing for longer than expected and started after the harms were already realized. *See* Jeff Blagdon, *Do Not Track: an uncertain future for the web's most ambitious privacy initiative*, The Verge (Oct. 12, 2012), http://www.theverge.com/2012/10/12/3485590/do-not-track-explained.

6. *See, e.g.*, U.S. CONST. amend. IV, and the case law that has formed around it; *see also* Olmstead v. United States, 277 U.S. 438, 478 (1928) ("The makers of our constitution undertook to secure conditions favorable to the pursuit of happiness... They sought to protect Americans in their beliefs, their thoughts, their emotions and their sensations. They conferred, as against the government, the right to be let alone, the most comprehensive of the rights and the right most valued by civilized men.").

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a useful way to discuss these issues and identify certain harms that may arise from new technologies.[8]

Before getting into the details of Professor Surden's framework, it is helpful to define what privacy means within this area. While many definitions have come and gone, the most appropriate definition of privacy for this paper is as follows: "the ability to control information about oneself."[9] This definition is appropriate because it focuses on the individual wanting to protect his or her privacy, and the definition remains true regardless of who or what attempts to violate that privacy.

A. Professor Surden's Framework

Professor Surden builds a framework for analyzing privacy rights by looking to different constraints as regulators of human behavior.[10] Traditionally, privacy rights are those that arise out of positive legal rights that have been "explicitly identified and instantiated by rule-makers."[11] However, it is shortsighted to believe that this is the only privacy protection we have. Instead, there are four major categories of constraints: (1) laws, (2) markets, (3) social norms, and (4) constraints which are based upon the physical and technological state of the world.[12] This fourth category is what Professor Surden collectively refers to as "structural constraints."[13] All of these constraint categories are able to control or modify behavior by changing the *costs* of engaging in certain activities.[14] For example, the law raises costs by creating legal punishments, such as fines or imprisonment. Markets create economic costs, and social norms create social costs.[15] Structural constraints, in turn, create physical and/or technological costs for conducting

http://lawweb.colorado.edu/profiles/profile.jsp?id=316 (last visited Sept. 29, 2013).

8. Harry Surden, *Structural Rights in Privacy*, 60 SMU L. Rev. 1605 (2007), *available at* http://ssrn.com/abstract=1004675. Although the journal is paginated as 1605-1629, the SSRN paper is paginated 100-45. As such, I will be citing to page numbers from the SSRN version.

9. *Id.* (citing Eugene Volokh, *Freedom of Speech and Information Privacy: The Troubling Implication of a Right to Stop People from Speaking About You*, 52 Stan. L. Rev. 1049, 1050 (2000)); Kent Walker, *Where Everybody Knows Your Name: A Pragmatic Look at the Costs of Privacy and the Benefits of Information Exchange*, 2000 Stan. Tech. L. Rev. 2, ¶ 5 (2000), *available at* http://stlr.stanford.edu/pdf/walker-information-exchange.pdf (defining privacy as "the ability to prevent other people or companies from using, storing, or sharing information about you").

10. Surden, *supra* note 8 at 110.

11. *Id.* at 102.

12. *Id.* at 110.

13. *Id.*; Lawrence Lessig, *The New Chicago School*, 27 J. Legal Stud. 661, 662-63 (1998).

14. Surden, *supra* note 8, at 111. Costs are considered in a broad sense, rather than just monetary costs.

15. *Id.*

activities.[16]

Because different behavior regulating mechanisms exist, policymakers and society alike are faced with the challenge of how to use each of these mechanisms effectively.[17] Typically, rule-makers will tend to look to law to control behavior because the law is what they know best.[18] Society, however, will often create its own social, market, and structural-based constraints without the involvement of any policymakers or rule-makers.[19] Many of these constraints may be formed unconsciously by society or may be a natural result of the current state of the world.[20] Such unconsidered constraints are of a particular importance to privacy because many of the privacy "rights" we appreciate today are merely the result of latent, non-legal constraints on behavior.[21]

More specially, structural constraint mechanisms have played a key role in protecting society's privacy interests.[22] There are two different types of structural constraints: (1) explicit structural constraints and (2) latent structural constraints.[23] Explicit structural constraints are those things that are intentionally placed to raise the costs of certain behaviors and to sometimes prevent such behaviors entirely. For example, a property owner may put up a fence to raise the cost of someone entering his or her property.[24] Additionally, a homeowner may construct walls on his house to protect others from seeing what is inside. Another form of explicit structural constraints arises from technology. In a technological sense, passwords and encryptions are structural constraints because they raise the costs of reading password-protected or encrypted files.[25]

Unlike explicit structural constraints, latent structural constraints are those constraints that are the natural result of the current state of the world.[26] These latent structural constraints impose secondary costs on behaviors that would encroach on individuals' privacy.[27] Some of the most important of these latent constraints are those that impose costs that are so high, they render certain behaviors almost impossible.[28] For example, a person's thoughts are often considered to be his or her most private possession.[29] This is only true because people do not currently

16. *Id.*
17. *See id.*
18. *Id.*
19. *See id.*
20. *See id.* at 113-14.
21. *Id.* at 114.
22. *Id.*
23. *Id.*
24. *Id.* at 114-15.
25. *See id.* at 115.
26. *Id.*
27. *See id.*
28. *Id.*
29. *See, e.g.*, Olmstead v. United States, 277 U.S. 438 (1928).

possess the ability to read another's mind, which is the result of latent structural constraints. In other words, the current state of the technological world has created costs so high that it is impossible (or nearly impossible) to read someone's mind—effectively creating a non-legal privacy right to one's own thoughts. Additionally, some explicit structural constraints are only effective as constraints because there exist latent structural constraints as well. To use the example of a wall of a house from above, the wall only protects one's privacy because the latent structural constraints have created costs high enough that people cannot see through the walls. Notably, these privacy interests are not just interests to keep our thoughts private from the government, but also from other members of society.

B. Advancing Technology's Effect on Structural Constraints

As technology advances, latent structural constraint mechanisms are often eroded, and the costs that such mechanisms impose are lowered, sometimes significantly.[30] For instance, let's again consider the example of the wall of a house. The wall works as a structural constraint protecting privacy because others cannot see through the wall. Through the advancement of technology, however, it is now possible to partially "see" through the walls of a house using thermal imaging. After the introduction of thermal imaging, the wall now provides less privacy protection than it previously provided. As such, some other mechanism must be put in place to protect the privacy interest at the same level. One could add additional "thermal imaging proof" materials to the walls, or the law could be used to regulate the use of thermal imaging devices. In this situation, the law was adapted to partially alleviate this privacy erosion.[31] In *Kyllo v. United States*, the Supreme Court held that under the Fourth Amendment, the use of thermal imaging by the police required a search warrant.[32] This ruling, however, does not prevent the use of thermal imaging by non-government members of society nor does it prevent the government from using thermal imaging all together.[33] Thus, the creation of thermal imaging technology has still lessened the public's privacy right that was in place prior to the existence of thermal imaging technology.

Professor Surden refers to this ongoing erosion of latent structural constraints by technology as the "structural rights/emerging technology

30. Surden, *supra* note 8.

31. Kyllo v. United States, 533 U.S. 27, 40 (2001) (reversing a conviction based on thermal imaging evidence where the police did not have a warrant).

32. *Id.*

33. *See id.*

dynamic."[34] Because the goal of technology itself is often to reduce transactional and operational costs, advancements in technology allows for conduct that was previously too cost prohibitive to take on.[35] As these cost-eroding technologies become widespread, there is effectively a "rights shift."[36] In the words of Professor Surden:

> The default state of the world changes from one in which the structural privacy interest was adequately protected to a world in which the privacy interest in no longer protected. Assuming there is no parallel constraint mechanism—law, norms, or markets—to continue to safeguard the privacy right, this phenomenon can be seen as the loss of a previously held right.[37]

Unfortunately, although optimistic, we often focus on the cost reducing benefits that new technology will provide without immediately considering the possible harms that are associated with the technology. In some cases, it is difficult to recognize these harms at the outset because they are not obvious, or the latent structural constraint that is being eroded is not obvious. However, where these latent structural constraints can be identified prior to the widespread use of a new technology, policymakers can implement another form of constraint, such as law, to prevent the loss of the previously held privacy right.[38] Therefore, in the next section, I apply the framework and principles of the "structural rights/emerging technology dynamic" from this section to the emerging augmented-reality technology, Google Glass, to determine what latent structural constraints will be eroded by this new technology. By identifying possible privacy rights erosions prior to the widespread use of Google Glass, policymakers or society as a whole will be able to consider whether another form of constraint may be needed to protect the privacy interests in place today.

III. THE LATENT STRUCTURAL CONSTRAINTS ERODED BY GOOGLE GLASS

Google Glass appears to be the next major advancement in augmented reality technology.[39] Indeed, *Time Magazine* has already

34. Surden, *supra* note 8, at 123-24; Other authors have also recognized the effect advanced technologies have on privacy interests. *See, e.g.,* Lessig, *supra* note 13; Christopher Slobogin, *Public Privacy: Camera Surveillance of Public Places and the Right to Anonymity*, 72 Miss. L.J. 213, 264-66 (2002); Daniel J. Solove, *Identity Theft, Privacy, and the Architecture of Vulnerability*, 54 Hastings L.J. 1227, 1228-30 (2003).

35. Surden, *supra* note 8, at 124.

36. *Id.* at 125.

37. *Id.*

38. *Id.* at 126.

39. *See, e.g., Google Glass (Google +)*, *supra* note 4; *Google Glass (Mashable)*, *supra*

named Google Glass to be one of the "Best Inventions of the Year 2012," stating that "[Google] Glass is, simply put, a computer built into the frame of a pair of glasses, and it's the device that will make augmented reality part of our daily lives."[40] Prior to analyzing the latent structural constraints involved with Google Glass, it is first useful to look at a brief history of augmented reality.

A. A Brief History of Augmented Reality

Augmented reality ideas have tantalized us for years on the big screen and have been taken to great lengths by those in Hollywood. Recent Hollywood blockbusters featuring such technologies include films in the *Iron Man* series, *Transformers* series, *Minority Report*, and, classically, the *Terminator* series, to name a few. These augmented reality ideas, however, are becoming more of a "science fact" than a "science fiction."

Even before these movies were popular, scientists were already trying to create a usable augmented reality system. In 1968, a working prototype of an augmented-reality system was developed by Ivan Sutherland.[41] A photo of then Ph.D. student Sutherland wearing his system is shown below.[42]

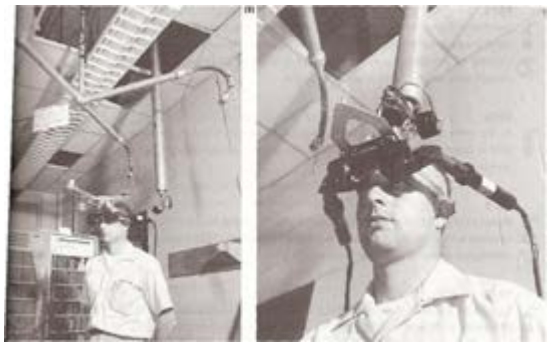

FIGURE 1

As can be seen from the picture, this head-mounted system had to be suspended from the ceiling because it was "rather heavy and

note 4.

40. *Best Inventions of the Year 2012: Google Glass*, TIME (Oct. 31, 2012), http://techland.time.com/2012/11/01/best-inventions-of-the-year-2012/slide/google-glass.

41. Scott Peppet, *Freedom of Contract in an Augmented Reality: The Case of Consumer Contracts*¸ 59 UCLA L. Rev. 676, 689 (2012); Ivan E. Sutherland, *A Head-Mounted Three-Dimensional Display*, Proc. Fall Joint Comp. Conf. 757 (1968), *available at* http://141.84.8.93/lehre/ss09/ar/p757-sutherland.pdf.

42. Sutherland, *supra* note 41, at 761.

uncomfortable to use."[43] The goal of Sutherland's system was to present the user with a perspective image which changed as he moved.[44]

As augmented-reality experimentation continued, information was continually added to the displays, and work towards a *Terminator*-type heads-up display was underway.[45] Experiments included outdoor navigation systems for the visually impaired, backpack-based systems combining head-worn displays, location awareness and computational ability, and battlefield information systems along with flight displays for fighter pilots.[46] With the development of mobile computing and mobile devices throughout the 1990s and 2000s, augmented-reality technology was ready to go mobile.[47] Wireless internet, the Global Positioning System (GPS), and cellular-based internet access have also been major factors in preparing augmented reality for success.

Some successes and advancements in augmented reality systems have recently occurred, yet none have been in widespread use and many are still not commercially available.[48] Notably, one recent augmented reality advancement that garnered significant attention (mostly via viral video) was the "Sixth Sense" project developed by Pranav Mistry.[49] In this project, Mistry chose to implement his augmented reality via a wearable projector instead of using goggles or glasses.[50] In essence, the system incorporates a projector attached to a smart device which projects images onto products or surfaces we interact with on a daily basis.[51] The system is then capable of identifying products, faces, and other visual objects, such as articles in newspapers.[52] The "Sixth Sense" then allows a user to interact with the system via different hand gestures.[53] This invention was displayed in 2009 and received rave reviews but has yet to reach the market by Mistry or any other major technology company.

43. *Id.* at 760; this eventually led to the system being called the "Sword of Damocles." *See* Peppet, *supra* note 41 at 689 *and* Stephen Cawood & Mark Fiala, Augmented Reality: A Practical Guide 2 (2007) (explaining the origins of the "Sword of Damocles" nickname).

44. Sutherland, *supra* note 41, at 757.

45. *See* Peppet, *supra* note 41, at 689.

46. *Id.*

47. *See id.*

48. *See, e.g.*, Peppet, *supra* note 41, at 693-94 (citing, e.g., *Vehicle Displays: Head Up Displays*, Microvision, https://www.microvision.com/solutions/head_up_displays.html (last visited Sept. 29, 2013); Paul Ridden, *World First GPS Goggles With Head Mounted Display*, Gizmag (Oct. 8, 2010), http://www.gizmag.com/zeal-recon-transcend-gps-head-mounted-display-goggles/16605.).

49. Peppet, *supra* note 41, at 694; Pranav Mistry, *sixthsense*, PRANAVMISTRY.COM, http://www.pranavmistry.com/projects/sixthsense/ (last visited Jan. 18, 2013). The Sixth Sense project went viral quickly in part due to the TED2009 presentation.

50. Emily McManus, *An Interview with Pranav Mistry, the genius behind Sixth Sense*, TED Blog (Mar. 11, 2009, 1:00 PM), http://blog.ted.com/2009/03/11/sixth_sense_pranav/.

51. Mistry, *supra* note 49.

52. Peppet, *supra* note 41, at 694-95.

53. *Id.*

While there does not seem to be a concrete reason for this delay, Mistry has merely stated that "things take time."[54] Fortunately, while we continue to wait on Mistry, Google Glass should be available to the public for purchase within the next year.[55]

B. Google Glass

On April 4, 2012, Google introduced its Google Glass project that was likely under development since 2010, if not earlier.[56] As initially disclosed, Google Glass has taken the functionality of a smart phone and integrated it into a pair of glasses.[57] The Google Glass system also comes in a compact, somewhat stylish pair of glasses (especially compared to Sutherland's headset[58]), as shown below.[59]

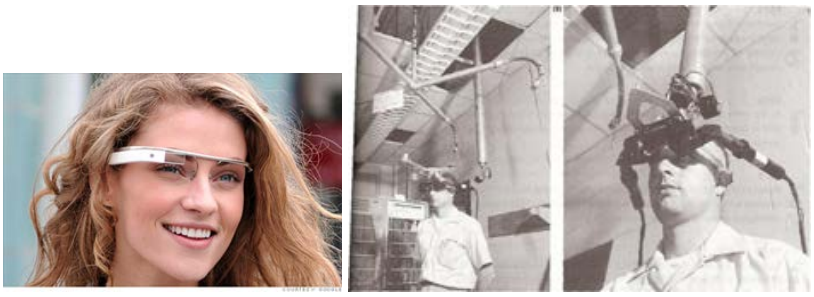

FIGURE 2

Back in 2010, Google's Eric Schmidt suggested that pushing information to users in real time will be more important to Google than its (then) current search capabilities,[60] and Google seems to be moving in a direction consistent with Schmidt's statements. While Google has been

54. Jesse Brown, *Stuck between invention and implementation*, Maclean's (Feb. 25, 2011, 2:35 PM), http://www2.macleans.ca/2011/02/25/stuck-between-invention-and-implementation/.

55. *Best Inventions of the Year 2012: Google Glass*, *supra* note 40.

56. David Goldman, *Google unveils 'Project Glass' virtual-reality glasses*, CNNMoney (Apr. 4, 2012, 2:35 PM), http://money.cnn.com/2012/04/04/technology/google-project-glass/?source=cnn_bin.

57. *Id.*; *Project Glass: One day...*, YouTube (Apr. 4, 2013), http://www.youtube.com/watch?v=9c6W4CCU9M4 (the initial video release from Google).

58. *See* Figure 1, *supra*.

59. Photo of the Google Glass glasses, Google+, https://lh4.googleusercontent.com/-quy9Ox8dQJI/T3xUHhub6PI/AAAAAAAAHAQ/YvjqA3Pw1sM/s420/glass_photos.jpg (last visited Jan. 18, 2013).

60. Peppet, *supra* note 41, at 694; *see also* Holman W. Jenkins, Jr., *Google and the Search for the Future*, Wall St. J., Aug. 14, 2010, at A9 (quoting Schmidt as saying, "[O]ne idea is that more and more searches are done on your behalf without you needing to type. I actually think most people don't want Google to answer their questions. . . . They want Google to tell them what they should be doing next.").

a bit cagey about all the features of Google Glass, likely because the project is still in development, Google has revealed some of the possible capabilities. First, the spectacles will have a video camera built into the frames so that the Google Glass system can record and analyze what the user is seeing.[61] There will also be a display screen for the user to see the augmented reality information.[62] Whether that display screen will be small, as pictured in Figure 2, or a full lens, has yet to be determined.[63] A microphone and speaker will also be included; however the controls are still not clear.[64] Some suggest that the controls may be voice and motion based, i.e., movements of one's head could indicate selections and scrolling.[65] Recent news suggests the Google Glass system will actually include a small projector to project controls or a virtual keyboard onto the user's hand or arm.[66]

As shown in the initial video, Google has plans to implement full Google functionality into the glasses.[67] For instance, there will be a navigation system, weather information, video chat, and live transportation updates, among other things.[68] Presumably, the current functionality of the Google Goggles application will also be implemented into the Google Glass project, which will allow for people to effectively perform live searches by looking through the glasses.[69] Google Goggles also provides the functionality of analyzing and identifying images, such as products. Additionally, considering the current success of Face.com and its acquisition by Facebook, along with the facial recognition technology shown in 2009 by Mistry's Sixth Sense, it would also not be unreasonable to believe that Google Glass will implement some type of facial recognition features.[70] At the very least, Google Glass should be able to incorporate the functionality that is

61. *See Project Glass: One day*, *supra* note 57; James Rivington, *Project Glass: what you need to know*, TechRadar (Aug. 8, 2012), http://www.techradar.com/us/news/video/project-glass-what-you-need-to-know-1078114.

62. *Id.*

63. *Id.*

64. *Id.*

65. *Id.*

66. Andy Boxall, *Google considers laser projected virtual controls for Project Glass, because it's not sci-fi enough already*, Digital Trends (Jan. 17, 2013), http://www.digitaltrends.com/mobile/project-glass-patent-shows-laser-projected-virtual-control-system/; U.S. Patent Application Serial No. 13/533,120 (filed June 26, 2012, published Jan. 17, 2013).

67. *See Project Glass: One day*, *supra* note 57.

68. *Id.*

69. *Google Goggles*, Google, http://www.google.com/mobile/goggles/#text (last visited Jan. 18, 2013).

70. Mistry, *supra* note 49; Alexia Tsotsis, *Facebook Scoops Up Face.com For $55-60M To Bolster Its Facial Recognition Tech*, TechCrunch (June 18, 2012), http://techcrunch.com/2012/06/18/facebook-scoops-up-face-com-for-100m-to-bolster-its-facial-recognition-tech/.

currently seen on a modern smartphone, and that "ability to access digital information—email, instant messages, walking or driving directions, lecture notes, product information, and so on—directly through your eyeglasses would obviously bring augmented reality to a dramatically different level than being forced to use your smartphone."[71] Although this list is likely not entirely accurate or complete at this point, it provides a good basis for analyzing some of the benefits and structural constraints involved.[72,73]

It is hard to determine all the benefits of Google Glass before it is in widespread use, "but it would be very surprising if there were none."[74] To avoid being pessimistic, there are likely some identifiable benefits. Users wearing Google Glass with facial recognition will never forget a face again. In fact, Google Glass may be able to remember everything for the user, not just faces, but also facts and information. The benefits of an unlimited memory are seemingly endless and would likely be one the greatest benefits offered by Google Glass. Additionally, users could use Google Glass for navigation and have directions and maps overlaid on top of their normal view. Users could also get live searches of products and conduct online shopping on the fly. This live information could also eliminate certain transaction costs associated with asymmetric information and other contractual issues.[75] Almost everything that we see today could be enhanced in some way, but such enhancements do not come without risks of privacy interest erosions.

C. Latent Structural Constraints Identified

The first latent structural constraint that may be eroded by the implementation of Google Glass relates to the possible facial recognition

71. Peppet, *supra* note 41 at 694.

72. More information should be revealed soon as Google is giving developers who have pre-ordered glass an early look this month (January 2013) at two "hackathons" in New York City and San Francisco. *Google's 'Project Glass' eyeglasses connect to the web, display info right before your eyes*, The Denver Channel, (Jan. 18, 2013), http://www.thedenverchannel.com/money/science-and-tech/googles-project-glass-eyeglasses-connect-to-the-web-display-info-right-before-your-eyes.

73. It is important to note that even if Google fails to deliver and the Google Glass project is no more than a wearable webcam, other competitors, including Microsoft already have similar technology in development. Chris Smith, *Microsoft plotting Google Project Glass rival with augmented live events*, Tech Radar, (Nov. 22, 2012), http://www.techradar.com/us/news/world-of-tech/microsoft-plotting-google-project-glass-rival-with-augmented-live-events-1114627. As such, this analysis would be appropriate for other similar technologies. Google Glass was chosen because Google's current development, success, popularity, cash flow, and resources lead one to believe that it is likely to be successful in this project.

74. Peter Eckersley, EFF Technology Projects Director, discussing Google Glass over lunch at the Silicon Flatiron's Technology of Privacy Conference (Jan. 11, 2013).

75. *See* Peppet, *supra* note 41.

function. Prior to Google Glass, individuals effectively had the right to not be recognized by strangers while in public. While this may not be true when dealing with the government, up until now, it has been very difficult for one person to immediately know the name of a perfect stranger (unless he or she was wearing a name tag). In other words, the costs of identifying a stranger in real time are so high that it effectively renders such an activity impossible. Indeed, as of now, to identify a stranger, a person would have to follow a series of user-initiated steps. For the most efficient, low-cost example I can think of, a person, Patty, would first take a picture of the stranger, Steve, with her smartphone. This step has its own social costs associated with it as well because people generally do not like to have their pictures taken while walking down the street. After snapping the photo, Patty could use a search tool like Face.com,[76] another consumer available facial recognition program, or possibly Google Goggles to try to determine Steve's identity.[77] Once Patty gets the results and determines that the stranger she just took a picture of is Steve, she can now search for Steve to determine if there is any additional information about Steve on the web. If Patty has acted quickly, roughly ten minutes have passed and Patty is finally ready to determine if she wants to interact with Steve. Unless Patty and Steve have stayed in the same place for this entire time or Patty has been eerily following Steve, it is likely too late for Patty to interact with Steve. These costs multiply as Patty tries to complete these steps for every stranger she passes or every stranger in the room.

The costs of completing all these steps have realistically prevented individuals from conducting such facial recognition. With the implementation of Google Glass and live facial recognition, this process will become automated, almost instantaneous, and, as Google Glass becomes popular, may also be free of the associated social costs. By reducing or eliminating these costs by removing the latent structural constraints, the emergence of Google Glass will eliminate any perceived right to remain anonymous to strangers while being in public.[78]

To prevent this loss of a privacy right, different forms of constraints will need to be put in place. The law could be used to regulate the use of facial recognition technology, possibly requiring Google Glass to have a

76. Face.com is no longer active as a freestanding website since its acquisition by Facebook. *See* FACE.COM, http://face.com/ (last visited Sept. 29, 2013).

77. For a presentation on the current state of facial recognition technology and additional privacy considerations, *see* Allessandro Acquisti, *Faces of Facebook: Privacy in the Age of Augmented Reality*, Heinz College, Carnegie Mellon Univ. (2012), *available at* http://blackhat.com/docs/webcast/acquisti-face-BH-Webinar-2012-out.pdf.

78. Although this paper does not look to determine which rights to privacy are considered important or any type of hierarchy of rights, one could argue that this particular right is not important or worth worrying about. However, one need only look to a celebrity and his or her often hostile relationship with paparazzi to see an opposing argument.

certain time delay in identifying faces. Such a solution would seemingly maintain the status quo that exists today. Besides law, society may impose additional social costs to wearing Google Glass if live facial recognition is available. For example, members of society may judge harshly those who wear Google Glass because they believe that use of Google Glass violates their privacy. Other explicit structural constraints could also be used to defeat the facial recognition technology. However, many of these additional structural constraints come with associated social costs. For example, one could simply wear a mask to avoid being recognized, but the social costs of wearing a mask in public are not trivial. Recognizing these potential social costs, Japanese researchers have developed the "privacy visor" that is meant to shield one from facial recognition technology by emitting infrared light to interfere with cameras.[79] This terse analysis merely scratches the surface of possible solutions that likely exist for solving this problem, and it is meant to provide only a small starting point for future discussion.

There are also latent structural constraints relating to the processing and recording of the video data taken by Google Glass. Currently, there is an ongoing debate surrounding "big data" and Internet tracking of user's activity.[80] In the current technological state, data aggregators collect data that is limited to what websites we visit and how we use the Internet. However, the existence of this limitation is certainly not because data aggregators do not want more data, but because there are much higher costs associated with obtaining that data. Today, data aggregators use things like cookies, super cookies, browser fingerprints, and other similar methods to learn as much about you as they can, but there are limitations to this collection process as well. For example, such tracking mechanisms are browser based and can be easily evaded or tricked by using VPN connections or other encryption methods, disabling cookies, and using multiple browsers.

Google Glass transmits much more information than just simple web browsing, it transmits everything a user experiences as he or she sees it.[81] This may have major privacy implications for those people

79. As of now, the social costs of wearing these glasses still seems to be pretty high (see the picture), but the final product could be quite stylish and at a reasonable estimated price of $1. (Also, the "purple" light seen in the photo would not be seen by the naked eye). Ryan Gallagher, *These Goofy-Looking Glasses Could Make You Invisible to Facial Recognition Technology*, Slate (Jan. 18, 2013, 3:12 PM), http://www.slate.com/blogs/future_tense/2013/01/18/isao_echizen_and_seiichi_gohshi_s_privacy_visor_shields_you_from_facial.html.

80. *See, e.g.*, Blagdon, *supra* note 5; Paul Ohm, *Broken Promises of Privacy: Responding to the Surprising Failure of Anonymization*, 57 UCLA L. Rev. 1701 (2010); *Consumer Data Privacy in a Networked World*, The White House, (Feb. 23, 2012), http://www.whitehouse.gov/sites/default/files/privacy-final.pdf.

81. This statement relies on the assumption that Google Glass must transmit the video it

whose images and actions are captured by Google Glass, but there will also be major privacy implications for those wearing Google Glass. First, the implications for a person who is captured on Google Glass, i.e., the non-user, will be considered. As discussed above, this could include the names and faces of all the people a user meets or even passes on the street. It could also include previously unknown details about those people. Google Glass would be recording and transmitting a person's clothing preferences, where they live, where they work, their speech patterns, travel patterns and preferences, and with whom that non-user interacts, just to name a few.

Businesses are already trying to capture many of these pieces of data, but currently the costs of doing so on a widespread level are prohibitively high. Today, the fashion industry has added facial recognition cameras into mannequins.[82] These mannequins record statistics like gender, race, and approximate age to improve targeted marketing.[83] The mannequins also record consumer reaction when looking at certain items, and development is underway for recording sounds and phrases heard from customers.[84] Businesses have, however, stopped short of having these anthropomorphic video recorders leave the store and follow you down the street. This is likely due to the high economic costs of the mannequins along with the incredibly high "creepy" social costs of sending mannequins on reconnaissance missions.

Google Glass removes these latent structural constraints by creating an army of real-life video-recording mannequins, i.e., Google Glass users. As the use of Google Glass becomes widespread, people will be hard-pressed to go anywhere in public without being recorded by a Google Glass device. This will allow data aggregators to turn the current state of "big data" into "massive data" with minimal costs. Unless other constraint mechanisms are put into place, the "digital dossiers" of every individual are likely to expand at an exponential rate.[85] While there may be some benefits to having such an abundance of data,[86] such a massive

captures for remote processing—likely via cloud computing technologies that have already been developed by Google.

82. Liz Klimas, *'Spooky' Mannequins Outfitted with Facial Recognition Cameras Spy on Shoppers*, The Blaze (Nov. 21, 2012 1:38 PM), http://www.theblaze.com/stories/2012/11/21/spooky-mannequins-outfitted-with-facial-recognition-cameras-spy-on-shoppers/.

83. *Id.*

84. *Id.*

85. *See* Daniel J. Solove, The Digital Person: Technology & Privacy In The Information Age 1–2 (2004) (defining the digital dossier).

86. *See* Omer Tene and Jules Polonetsky, Judged by the Tin Man: Individual Rights in the Age of Big Data, Presentation Before the Silicon Flatirons Technology of Privacy Conference (Jan. 11, 2013), *available at* http://www.siliconflatirons.com/documents/conferences/2013.01.11%20Privacy/Tene_Privacy

collection of data likely violates the privacy interests and rights that we as a society appreciate today due to the latent structural constraints that prevent such large-scale data collection.

While much of the above problem could be prevented by implementing other constraints to prevent facial recognition as discussed above, such as the "privacy visor,"[87] data privacy concerns for the user of Google Glass are likely even higher. Google Glass users are not only recording the actions of other people, but they are also recording all of their own actions from a first-hand point-of-view. Previously, the costs for a data collection company have been high and have effectively prevented them from collecting this type of detailed data. But now users will likely be wearing Google Glass more than they use their smartphones because of the added ease and convenience. With increased use and increased data capture, the user's own "digital dossier" will expand even more quickly than those around him or her.[88] This erosion of latent structural constraints is similar to the issues being discussed in the current Do Not Track debate.[89] The Do Not Track debate has arisen because latent structural constraints were removed with emergence of the Internet, cookies, and digital fingerprint tracking. By removing the latent structural constraints, data aggregators were then able to track users' activities without their knowledge. With the emergence of Google Glass, data aggregators will now be able to track even more about a user—possibly without his or her knowledge. Such data collection is particularly likely considering that the data will be processed by Google, which prides itself on providing "free" services (at the cost of data) and is the owner of Double Click, one of the largest Internet advertisers around. With this additional data, Google Glass could take targeted advertising to an entirely new level. Such advertising would likely be unnervingly accurate and would interact with almost everything the user interacts with. Some members of the media have already identified this possible harm and have asked the question "is Project Glass evil?"[90] Others have created parodies of what the Google Glass experience might really look like when supplemented with ads.[91]

To maintain the privacy right that people currently have in not giving aggregators a live feed of their entire lives, other constraint mechanisms will have to be put in place to make up for the latent

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87. Gallagher, *supra* note 79.

88. *See* Solove, *supra* note 85.

89. *See* Blagdon, *supra* note 5.

90. Rivington, *supra* note 61 (answering the question with "it could be."). My answer is simply "no."

91. *ADmented Reality – Google Glasses Remixed with Google Ads*, YouTube (Apr. 5, 2012), http://www.youtube.com/watch?v=_mRF0rBXIeg.

structural constraints eroded by Google Glass. First, explicit structural constraints do not seem to work well in this situation. For example, the user himself cannot wear a "privacy visor" to prevent Google Glass from identifying the user. The user will have already voluntarily provided his or her identifying information to Google Glass, either at purchase or through some form of sign-up. Additionally, encryption will only help prevent others, such as hackers or eavesdroppers, from accessing the transmitted data. Even with encryption, Google itself will still be able to decipher the data because it will need to analyze the transmitted data in order to provide useful augmented-reality data on the Google Glass screen. Increased social costs may not be immediately useful either. As we have seen in the Do Not Track debate, there has not yet been a massive public outcry against data collection. Also, the user is voluntarily choosing to wear and use Google Glass. Thus, law and policy are left to come to the rescue. Here, the debate will be very similar to that of Do Not Track, and if Peter Swire and the rest of the W3C participants look forward far enough, this Google Glass issue could be solved with careful wording in a Do Not Track agreement. Again, these solutions are meant to provide only a small starting point for future discussion of this potential problem.

IV. CONCLUSION

In a world where we are constantly surrounded by technology, we must be aware of our environment, our interests, and the true consequences of implementing new technologies. By analyzing technology, such as Google Glass, with our privacy interests in mind, we are able to determine where some of our interests may be impinged. While there are likely more latent structural constraints and solutions that are not considered or identified in this paper, all the constraints in danger of erosion by Google Glass should be contemplated before these constraints are eroded entirely. If this is done, society, policymakers, or even Google itself can proactively implement the necessary constraint mechanisms to keep our current privacy interests and privacy rights intact.