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# Google Going the Wrong Path: Privacy & Google Street View

## Abstract

Google Street View (GSV)is a web-based map providing street-level views of many cities across the world. This paper explores how GSV technology evolved; what GSV is 'for', from the perspective of GSV users and Google; what complaints have been made regarding the privacy impacts of GSV; and how Google has already responded to these complaints, on a technical and policy level. We evaluate several additional policy options and close with our recommendation for how Google should proceed.

## Summary of issue

### *The development of Google Street View*

In essence, Google Street View is system for capturing images and processing them to create a "street view"-style map, as opposed to traditional 2D maps (perspective from above) and 3D maps like globes or computer-based models (Weber, 2012). To accomplish this, GSV images are panoramic, meaning they capture a wider field of view than ordinary cameras by 'stitching' together several contiguous photos (Frich, 2016). Panoramic images make viewers feel more immersed and can recreate the effect of turning one's head to look to either side.

The technology for panoramic pictures was piloted at Stanford before catching the attention of Google CEO Larry Page in 2003 (Weber, 2012). Page and a Google team extended the technology to capture images from a moving vehicle, then launched their first major image capturing expedition in 2007. Deployed vehicles were equipped with multiple cameras, lasers, GPS and wind velocity monitors to pick up on depth, location and weather data; pictures were taken every nine to fifteen feet, preserved on harddisks, and sent back for processing.

To produce each final image, Google's processing software takes fifteen raw images, "mashes them together [and] adjusts the exposure for sun, shadows, color differences and brightness" (Olanoff, 2013). Google also uses text recognition software to mine geographic data from the images (for example, street signs and building names), then uses the data to populate or authenticate entries in the Google Maps databases (Weber, 2012).

In addition to capturing images of streets and buildings via cars, Google has now begun collecting images of wilderness areas and building interiors using "trikes, snowmobiles, hand-pushed carts, and even a backpack … [while] Google planes have also started filming 3D views from the air" (Weber, 2012).

### *What is Google Street View for?*

Bradley (2010) is the odd voice out when he says "I don't see much value in the Street View mode of Google Maps … [it] seems more like a novelty than a functional tool". In the eyes of its various users and in the eyes of Google, GSV has a definite purpose and value.

For consumers, GSV is the latest member in a long tradition of media for 'travel without travelling'. Writing, art, cameras, and video have all been used to give people the experience

of being in a place that no longer exists or is very far away. This media taps into and perhaps strengthens people's desire to see the world: "After Google Maps with Street View toured the streets of Pompeii, the excavated Roman city that was buried with volcanic ash in AD 79, real-world visits went up 30%. Similar stories hold for other attractions" (Weber, 2012). Google released its image archives in 2014, letting viewers simulate travel through time as well as space (Lichfield, 2014).

Additionally, people use GSV to familiarize themselves with an area they're about to visit, aiding with navigation; tax collectors, real estate agents, and permit enforcers use GSV to verify certain claims; and others use the site for entertainment, sharing humorous or compromising images they find (Weber, 2012). In at least one instance, GSV was used to solve a crime: "A SHOPLIFTER was caught red-handed with a bag of stolen goods after being captured on Google Street View" (Christodoulous, 2016).

From Google's perspective, the purpose of GSV is much broader. Larry Page first envisioned the service as "a digital, searchable representation of the entire physical world … available online" (Carlson, 2014). With the rise of other technologies, this already enormous ambition has grown into a vision of context-based computing services, where software would tailor advice and content to users in part depending on location cues. GSV specifically would become a dynamic cartographer that populates your map with things you're likely to be interested in—"before you even search for them" (Olivarez-Giles, 2013).

### *Complaints and legal violations*

Because it captures pictures of people and private property, GSV has faced complaints and lawsuits on many occasions in at least 27 countries (Boswick, 2011). India has banned GSV as a national security risk (Regidi, 2016); GSV incurred fines in Germany, France, and Italy (Sterling, 2014); Google ultimately withdrew GSV from Germany following widespread opposition (Murphy, 2011); and an American couple sued GSV (mostly without success) for entering a private driveway to take pictures of their home (Mills, 2008).

In addition to image-based privacy violations, there is some concern that GSV aids criminals in investigating targets and planning crimes (O'Donnell, 2016). Google was also sued by 37 states for gathering data from unencrypted but private wireless networks, ultimately settling for $7M and promising policy changes (Streitfeld, 2013).

### *Google's response*

Google has reacted to complaints in several ways. When GSV images are processed, faces and license plates are now automatically blurred; users can request further blurring or removal of specific images ("Image acceptance", n.d.). As part of a case settlement, Google also committed to training its engineers, lawyers, and other employees to respect privacy and incorporate it into the design of products (Streitfeld and Miller, 2013).

These actions, however, should be considered realistically for what they are: compelled by external parties and in conflict with Google's established norms. As CEO, Larry Page sets the tone with his belief that people are inclined to unwarranted pessimism and fear about new technologies, but will ultimately be won over by increased convenience: "For me, I'm so excited about the possibilities to improve things for people, my worry would be the opposite … We get so worried about these things that we don't get the benefits" (Manjoo, 2014).

Elsewhere, Page has articulated Google's ambition to shift from a "demand" model—where software waits for users to activate its functions—to an "assist" model, where software volunteers actions based on its knowledge of a user and awareness of their context (Olivarez-Giles, 2013). Realizing this vision depends on attaining near omniscience; Google must capture copious data about the physical world and its users—their browsing, email, social network, movements, etc. (Rosenfeld, 2014). Given this overarching purpose, it is important

to question Google's ability to respect privacy independent of strong external oversight. For one, their use of an opt-out privacy model is subject to Solove's critique about the limitations of privacy self-management (2013).

## Stakeholder analysis

GSV's many stakeholders include users; governments; law enforcement (police, courts, and lawyers); regulatory agencies (environmental agencies, utility companies, land use permitting agencies, etc.); homeowners, property owners, real estate agents, businesses and owners of tourist sites; and Google itself.

### *Users*

"After Google Maps with Street View toured the streets of Pompeii, the excavated Roman city that was buried with volcanic ash in AD 79, real-world visits went up 30%. Similar stories hold for other attractions" (Weber, 2012). Undoubtedly, we "the people" as users of GSV are one of its stakeholders. As users, we want accurate information to help us navigate; we want realistic and beautiful images to give us the sensation of travel (or nostalgia in viewing a place we once knew). GSV has provided users with a lot of convenience and fun. In this way, users are in favor of expanding GSV and see no reason to limit it. However, we are not only users of GSV, but also people who might be captured in GSV pictures without notice. GSV's privacy issues began when Google captured pictures of people and private property in order to get the right number of pictures to map any neighbourhood in the world (Boswick, 2011). Google never sought permission from people it was filming or property owners whose properties were added to the GSV panoramic views (although later Google decided to blur faces and license plates during image processing). Most people, in fact, are oblivious to the fact that GSV vans are operating their areas. This clearly is a violation of people's privacy – constitutionally present in most of the countries of the world.

Hence users of GSV hold different views on its privacy issues. On the one hand, users love GSV for easing their lives to some extent;the governing ethos here might be the idea that information wants to be free and that these images belong to the public as common property, not to a self-motivated homeowner, etc. On the other hand, some users will feel that their privacy is ethically violated and that cannot be overlooked. So how to provide users with maximum convenience while at the same time protecting users' privacy has become a big problem for Google.

### *Governments*

Governments are important stakeholders of GSV. From the perspective of governments, GSV has two sides. It can build better public safety and improve emergency management, since it provides accurate information in the street. For example, a thief was caught by bored IT worker who spotted her fleeing a Savers shop on GSV (Holly, 2016). GSV can become a good tool to help investigate crime especially in places where CCTV is not that popular. But GSV also has the potential to be a weapon if used by terrorists, and as such it does pose a threat to national security. Therefore, government has an interest in making sure that GSV doesn't expose sites of national security relevance and at the same time—insofar as citizens pressure government to protect these rights—enforcing privacy laws.

Facing the problem of GSV, different governments make different choices. Many countries have in the past caused significant roadblocks to GSV's mission. In 2014 GSV started mapping in Bangalore, India, but before it could move to other cities, the Indian government banned GSV as a national security risk (Regidi, 2016). GSV also incurred fines in Germany, France, and Italy (Sterling, 2014). Governments, however, didn't draw a curtain on GSV only because of security concerns. In 2012 GSV was found to be using public Wi-Fi to gather pictures in several European countries without prior consent. Though Google claims to have used only pictures of the area collected over Wi-Fi, it incurred fines and temporary termination in

Germany, France, and Italy because it also accessed personnel data, all without permission (Sterling, 2014).

Given the large scale mapping GSV aims to achieve, every country being mapped automatically becomes a stakeholder of GSV and is predominantly involved in many lawsuits of GSV.

### *Google*

The biggest stake holder of this case for obvious reasons is Google, specifically their Maps and Street View unit. Google's CEO, back in 2003, started out with a dedicated team for GSV, which finally became a reality in 2007 (Weber, 2012). Google saw Street View as the next level for new generation maps that would enable real time ease of navigation and add to the growing list of "Travel without travelling" applications. Now, the purpose of GSV has become broader. The enormous ambition has grown into a vision of context-based computing services, in which software will tailor advice and content to users in part depending on location cues. Due to these reasons Google is the biggest stakeholder in GSV.

Google's interest in the technology is threefold. (1) Their rhetoric, and perhaps one of their genuine motives, is to "connect people" with each other and with the natural world. (2) Their business model is based on open and complete information for two reasons: (a) as an information 'pipeline', consumers only trust them if they believe the information is raw, unfiltered, and unbiased; and (b) as a data broker and marketing company, other companies will do business with them only if the information in question is thorough. Finally, (3) Google aspires to use GSV for context-based information services (i.e., geography- based marketing). So for these reasons, Google has an interest in resisting any filtering of GSV and in gathering as much information into GSV as possible. The governing ethos here might be considered utilitarian: Google is pursuing something that it believes will be good for a large number of parties, even though a few people will be hurt or offended by infringements on privacy.

## Policy options

### *Automatic blurring of faces*

As for possible policy solutions, Google has already implemented some efficient methods as a response to the complaints. First, when GSV images are processed, faces and license plates can now be automatically blurred. This increases privacy but slightly compromises the quality of images (statues and signs may be blurred). Google is not counted among the losers, because they received unblurred images for processing and so can extract any desired features (like street names) before blurring and publishing.

The winners of this solution should be every potential person who might be captured in GSV images, especially privacy-concerned pedestrians and drivers. Since this solution is implemented by algorithm which can be automatically achieved, it minimizes administrative cost. However, this solution might cause problem for users, law enforcement and regulatory agencies who want to get as much accurate information as possible from GSV. Law enforcement (police, courts, and lawyers) and regulatory agencies (e.g. environmental agencies, utility companies, land use permitting agencies, etc.) may want to use images for evidence in a legal case, criminal investigation, or permit claim. Therefore, blurred images may lose a lot of important information or clues for them to explore and investigate, since all the pictures having any identifiable information should be blurred out by default. In addition, imperfect blurring will confuse users. For example, in Japan (a country where Portrait Rights means that a photographer can be sued for publishing an image of someone taken in public, if that person feels it infringes upon their privacy or harms their reputation), this advanced facial technology recognition system should be very useful. But, the fact is that it is too thorough:

"Not stopping at only people's faces, their system also goes the extra mile and blurs out any inanimate objects with facial-like features, like in the following pictures" (Jamie, 2015).

### *Complaints process*

Secondly, GSV has set up a complaints process whereby people can have images of their property removed. People can submit requests to remove an entire house or car that they don't want to be public on GSV. And once Google removes an image, the effect is permanent.

The winners of this solution should be every property owner who is concerned about his or her own privacy. This solution gives people a mechanism for controlling their privacy. Because it's opt-out rather than opt-in, it maximizes the amount imagery that gets published. However, since this solution allows people to remove any item which they don't want to be showed on GSV, the losers of this solution will be Google, users, law enforcement, regulatory agencies and so on who want to get more information. Imagine if more and more privacy-concerned people remove their properties; then GSV will have no difference from typical 2D maps. Moreover, this solution places the burden of privacy management on individuals (Solove, 2013). An opt-out removal policy requires people's awareness of their privacy, because people need to submit the online request by themselves. In addition, it will increase administrative costs since Google needs to hire more employees to handle the removal requirements and to do the removal work.

These two already implemented solutions have both strengths and weaknesses, which means Google needs to consider more options and utilize more methods to deal with this issue. Our team has come up with some potential solutions that may help Google with this problem.

### *Stylized images in lieu of photos*

In some countries, GSV could be pictures of stylized buildings and trees, somewhat like a Snapchat filter, that removes actual details and leaves a skeleton sketch. Perhaps this could be done by taking the physical depth measurements already collected during construction of panoramic pictures (Weber, 2012) and using these measurements as the basis for 3D models instead. For this solution, winners should be privacy-concerned property owners and also the government who is concerned about national security. By using stylized images, most of the privacy concerns will disappear, and the street map rendered in the new style can at the same time express the exact same information as the previous one. However, the losers may be Google, users, law enforcement and regulatory agencies. Stylized pictures, unlike real images, cannot provide intuitive feelings for users or evidence for legal cases; without real images, GSV cannot help users see the real world.

### *Opt-in mechanisms*

The second solution we have is to run GSV on an opt-in basis in several ways. When taking the pictures of the street, Google can choose an appropriate time when no one is around—early morning/late night or midday. Or, Google could notify people in advance of driving through an area. With people's permission, Google does not need to deal with the privacy issues after publishing the pictures on GSV. For this solution, winners should be users, law enforcement, regulatory agencies and especially those privacy-concerned property owners. The only loser of this solution is Google because it will take Google a lot of time and effort to do image collection with the permission of every affected person in advance. It is also impossible to make sure that Google can get every individual's permission without missing anyone.

## Proposal

### *Basis of assessment criteria*

Several ethical frameworks offer justifications for privacy (Jaffe, n.d.). From a **rights perspective**, people have a right to avoid interference and a property right to their own information (although this property right can be challenged by the argument that creators of information have a property right too, equal to property rights of the information's subjects). From a **duty perspective**, the relevant imperative is to respect people by treating them as ends, not means; with respect to privacy, this could mean not collecting information for the sake of marketing, which treats people as consumers and as ends to making a profit. From a **virtue perspective**, the value of privacy might be evaluated by asking whether privacy supports the development of character; authors like Moore (2010) argue that it does, although claim could also be made that visibility leads to social accountability, leading in turn to good character (Ronson, 2015). A further test arising from virtue ethics is whether the privacy infringement rises to the level that a prudent person would worry about it. From a **consequentialist perspective**, finally, one would evaluate the effects of privacy either generally or on a case-by-case basis. One would weigh public interests in specific information against the possible harms. Possible public interests are public health, holding criminals accountable, and economic gains; possible harms are to individual reputation, personal development, autonomy, freedoms of thought and expression, and property value or security. There is also the risk of unanticipated harms where information is collected for good reasons but eventually abused, or information is integrated in unexpected ways that violate privacy severely.

The following criteria emerge from this review of ethical frameworks: does a policy option preserve people's control over their information as a form of personal property ("Ownership rights")? Does a policy option or technology exploit people as resources rather than treating them respectfully ("Exploitative")? Does a policy option seem likely to appeal to a prudent person ("Prudent")? Does a policy option balance public interests against individual harms and benefits in a compelling way ("Net impact")? Then, in addition to these ethical criteria, there are two that arise for practical reasons. Is a policy option technically feasible, and is it affordable?

### *Analysis of options*

As outlined in the table below, most options proposed are improvements over the baseline when it comes to respecting ownership rights, avoiding exploitation, and exercising prudence. What differentiates them is their net impact, feasibility, and affordability.

| | Ownership rights? | Exploitative? | Prudent? | Net impact on stakeholders? | Feasible? | Affordable? |
|---|---|---|---|---|---|---|
| Automatically blurred photos | Yes, somewhat | No | Yes | Positive | Yes | Yes |
| Process for removing images | Yes, somewhat | No | Yes | Positive | Yes | Yes |
| Remove actual details and leave a skeleton sketch | Yes | No | Yes | Likely positive, if still beautiful | Probably | Yes, if feasible |
| Notify people/cities/ countries in advance | Yes, if combined with opt-out process | No | Yes | Positive | Maybe not (depends on scale) | Maybe not (depends on scale) |
| Get approval before collecting | Yes (degree depends on scale) | No | Yes | Positive | Probably not (depends on scale) | Probably not (depends on scale) |
| Abolish the service, given its intended purpose (context- aware marketing) and the fact that it's being extended to even more sensitive realms | Yes, fully | No | Yes | Maybe positive, but relies on paternalistic assumptions | Yes | Yes |

Automatic blurring and Google's opt-out process are clearly feasible and affordable. The question is whether these options go far enough in protecting privacy, since they rely heavily on privacy self-management (Solove, 2013); we would argue not. We are especially concerned about the potential for Google to misuse information in the future. Information is a form of power, so unchecked corporate accumulating information should be viewed with suspicion. Further policies should be implemented in this aspect, for example, Google should fully inform people the information captured by GSV as well as its usage and potential consequence thus let people make their own decisions regarding opt-out.

Removing details by converting images to a pleasant artistic sketch, improving the protection of privacy yet still providing accuracy, is a purely technological solution. If this approach is feasible at all then it is likely to be affordable, because there will be low marginal costs once the technology is developed and the process of collecting data may itself become cheaper as a result of the new approach. If the aesthetics are pleasing enough, people may still appreciate the service for virtual travel, leading to a positive impact.

Advance notification would be an improvement in respecting privacy. Notification would likely not be feasible on the level of notifying individuals, but notification could be delivered at several different scales (national, statewide, county, city, neighborhood, etc.). Notification is a step that assists individuals in managing their own privacy, but a step further would be obtaining advance approval for data collection. This places responsibility solely on the company to elicit permission. The burden would likely be so heavy, however, that it would render the service unfeasible. There is very little chance that permission could be obtained consistently enough that map coverage would be thorough.

This leads to the most drastic option: to abolish Google Street View. This argument for this option would be that there is no compelling public interest in the information collected by GSV; there is only a private profit motive. Even if people as consumers elect to use the service, the absence of a compelling public interest and the potential for harm should be enough for government to ban the collection and use of this information. This is a paternalistic gesture, but perhaps it could be justified on the basis that consumers are not prudent judges of their best interest because their appetites and access to information are manipulated by powerful companies.

***Recommendations***

Based on our analysis of criteria to evaluate the possible policy alternatives, and given our concerns about Google's increasing power, we recommend a combination of policy options that increase privacy protections while stopping short of full abolishment.

First, we recommend that Google preserve its existing policies (of automatic blurring and removal upon complaint) while it explores the development of technology to de-identify images completely by converting them to beautiful 'sketches'. In a best case scenario, Google will be able to produce sketches by processing its existing images, using sensor data already collected. In the worst case scenario, Google will need to deploy vehicles (or drones, perhaps) to capture new measurements and/or images.

Second, we recommend that Google retroactively secure permission from state governments (or the equivalent political unit within each specific nation) and then obtain permission proactively as it extends coverage to new terrain. If state governments prohibit GSV in their jurisdictions then historically captured GSV images should be removed. Going forward, we believe that Google should be responsible for giving states a chance to restrict or ban collection in accordance with local circumstances and preferences. This lets states with extraordinary concerns about security and terrorist threats prevent Google's image collection activities entirely; other states may opt to restrict images to larger cities or to main roads.

These options allow Google to preserve GSV as a service that still satisfies users' desire for virtual travel, but respects the rights of homeowners and privacy-concerned individuals while avoiding the complex turf of GSV images being used for law enforcement and inspection purposes. These options also allow for variation in response to local privacy norms, rather than attempting a one-size-fits-all solution. Overall, they place a much higher burden on Google, but we believe it is an appropriate burden given the invasive nature of the technology and the fact that there is no compelling public interest in the continued existence of GSV (it is nowhere near the realm of vital infrastructure). Moreover, we believe it is important to resist the precedent set by Google and many other tech companies of rolling out invasive technology on a massive scale without consulting affected parties and governments.

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