Augmented Reality, Augmented Ethics:
Who Has the Right to Augment a Particular Physical Space?
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A. Introduction

Augmented reality (AR) is a particular blend of the physical and the virtual; specifically, it is the use of technology in order to project digital content onto our experience of the physical world. Moreover, the content projected depends on (and adapts to) properties of the surrounding space.[1] From Google Glass to *Pokémon GO* (Niantic Inc., 2016), the last several years have seen an increase in the development of products that use augmented reality – a trend which is not predicted to end any time soon. (Dainow, 2014)

AR technologies are not a new idea, and they have always had the potential to raise ethical concerns. However, the growth of the industry makes these issues more pressing; we have moved from a few engineers testing something out in a lab to millions of people wandering around their neighborhoods playing an AR-based game. Furthermore, AR is also being adapted for commercial use in workplaces (Doshi, Smith, Thomas, & Bouras, 2016), meaning that the number of users of AR and the types of situations in which it is encountered will likely increase. It thus behooves us to consider ethical problems that might arise.

After examining different types of AR technologies, I will touch briefly upon a number of ethical issues concerning AR that have been raised in the literature. I will then focus on property, namely, who has the right to augment a particular piece of physical space. Ultimately the answer will depend both on what sort of technology exists and what kind of space we are considering. Public and private spaces will give rise to different rights and complications. Furthermore, I will argue that there are ethical differences between a future where there are many different AR platforms and a future with a more unified sphere of augmentation.

B. Augmented Reality Technologies

There are a variety of ways that augmented reality can be implemented. For instance, *Pokémon GO* (Niantic Inc., 2016) is one of the more recent uses of augmented reality. Players of the game use an app on their phone to track and capture little monsters (Pokémon) which appear in various geographic locations. The players have to move in the physical world in order to experience the virtual content; unless they are in the right (physical) place, they will not see the Pokémon. This form of augmented reality is somewhat discrete; while the app can be running in the phone's background and alert the user to nearby Pokémon, the user is still generally experiencing a world that is not augmented – he only sees the creatures when engaging with the app.

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[1] As Brinkman (2014) notes, this makes augmented reality somewhat different than head's up displays (which may project information but do not adapt to the world), location-aware applications such as Google Maps (which track the user's location but do not project virtual information), and apps that do image processing (which may recognize that an image is of a particular subject but again does not project that information onto the world.) Augmented reality requires both the projection on to the world and the analysis of surroundings in order to adapt or change those projections.

While interacting with the world via a smartphone gives some access to augmented reality, people often envision AR as incorporating wearable technology. For instance, a person might wear a set of glasses that would superimpose visual input onto her surroundings. Google Glass was an early version of this technology and Microsoft's HoloLens is one of the current generation; in terms of future developments, Magic Leap is working on a slightly different technology which would laser project light on to a user's retina.[2] In any of these cases, as someone walked down the street wearing one of these devices, he would see not only what is physically in front of him but also virtual content which the AR device provides; instead of just seeing an old building, perhaps he would also see information about when it was built or an image of what it looked like before and after a restoration project.

Furthermore, there are specialized uses of augmented reality that are promising. Feng et al. (2014) discuss possible medical applications of the technology; for instance, a surgeon could superimpose images on a surgical site to aid her in the surgery. AR is also currently being used in certain manufacturing contexts, such as to aid welders by placing visual cues to assist them in determining the correct location for spot-welds. (Doshi et al., 2016) The potential uses of augmented reality in both general and specialized contexts are wide and varied.

At present, for the average consumer, AR technologies are still nascent. Much of the present work is on visual and haptic (touch-based) augmentations; those for senses such as smell or taste are less common.[3] Furthermore, different technologies do not necessarily integrate well with each other – we are currently limited to a large degree by the particular applications or technologies we are using to access the augmented world. In the future, however, a much more seamless experience might be possible. Instead of switching among multiple devices or applications, it might be possible to access augmentations more easily; a wider range of augmentations may also be possible, incorporating multiple senses.[4] As such, it is worth considering both current (or near-future) technologies, which involve augmentations on multiple platforms as well as possible future technologies which could create a more integrated sphere of augmentation. Ultimately, these will raise somewhat different ethical concerns.

C. Ethical Issues Raised By Augmented Reality

As with any new technology, AR technologies beget a number of areas for ethical concern. A useful framework for this discussion is provided by Friedman and Kahn (2000), who detail a number of values which raise important questions for AR design. Four of these areas – privacy, informed consent, deception, and ownership and property – have been explored by others in some detail. I will briefly outline a number of ethical issues that have been raised for the first three areas before focusing on questions pertaining to property.

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[2] See Wolf, Grodzinsky, and Miller (2015) for further discussion of these technologies.

[3] There is some interesting work being done on this kind of augmentation – see, e.g., Narumi (2011) – but it is still relatively rare compared to visual or haptic augmentation.

[4] This vision of a unified sphere of augmentation may lead to problems when we try to figure out how to integrate multiple applications or systems; Roesner, Kohno, and Molnar (2014) discuss how the implementation of augmented reality technologies may pose security and privacy concerns.

Privacy is perhaps the most obvious ethical quagmire that AR technologies encounter. Acquisti, Gross, and Stutzman (2014) created a very basic AR app that enabled them to gather information that was publically accessible online (such as from social media profiles) and combine it with facial recognition software in order to present information about strangers in real time to a user. While the app was fairly primitive, presenting only the person's likely name and social security number, it suffices to prove the general point: AR could be used in order to gain information about the people around us, even when those people would normally be anonymous. People have already raised concerns about the erosion of anonymity in public places (Doyle & Veranas, 2014), and augmented reality seems likely to enhance this problem. Roesner et al. (2014) also discuss privacy concerns of a more technical sort that stem from how the apps function. Given that the ideal seems to be a seamless integration with our regular experiences, this suggests that AR technologies will always be on; that means they are always going to be monitoring us. This raises questions of what information they are sharing and with whom.

Issues of privacy dovetail with issues of informed consent, particularly of those around the AR user. One of the key concerns many people (Denning, Dehlawi, & Kohno, 2014; Wolf et al., 2015) have about AR devices is their ability to record, particularly to record without being easily detectable. While most people will notice if you hold a smartphone up and start recording, they may not be able to tell whether someone wearing AR glasses is recording – indeed, they may not even be able to tell that the glasses have that potential, if the glasses are not visually distinguishable from regular ones. Similarly, while we often do not notice the surveillance cameras recording us in public, those are static; they do not move with an individual. AR technologies thus greatly enhance the ability of people to record those around them in a multitude of situations, and thus some kind of consent to be recorded should likely be obtained.[5]

Privacy and informed consent are long-standing ethical issues that are simply made more pressing by the adoption of augmented reality; they are not unique to this technology. However, AR also allows for a new kind of deception. Wolf, Grodzinsky, and Miller (2015) observe that if the technology advances to the point where the augmentations are indistinguishable from reality, then we have to worry about a new kind of deception. If a person enters a virtual world such as *Second Life* (Linden Research Inc., 2003), he is clearly aware that the objects he encounters are virtual and not physical. Similarly, in the physical world, we do not ordinarily wonder whether the objects we perceive are truly there.[6] In augmented reality, however, the blend of virtual and physical makes this pressing – it is entirely possible that we could experience something that is not really there and yet be convinced that it is. This makes questions of deception extremely important; since we value veridical experiences, people will likely want some way of knowing (in retrospect at least) what part of their experience was augmented.[7]

D. Rights Over Augmented Space

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[5] Determining what the requirements for consent will be is tricky, of course. We can almost certainly agree that it would be wrong to record in certain contexts, such as a changing room, but it is less clear how to handle something like a crowd at Disney World.

[6] Barring hallucinations or reading too much Descartes, that is.

[7] This is especially pressing since augmentations could be used to cause harm, such as if you augmented a regular walking surface over a gaping pit or, as Brinkman (2014) notes, a virtual advertisement over a physical billboard (thus preventing people from seeing the paid-for advertisement.)

While these areas are all worthy of further discussion, in this paper I will be focusing on questions pertaining to property and ownership. Specifically, I will address what ethical rights we have to augment or prevent augmentation of particular physical spaces. I am certainly not the only person to discuss this. Wolf, Grodzinsky, and Miller (2015) raise the question of whether someone should be able to own the visual experience of a public place or if there should be some kind of limits to augmentation. Brian D. Wassom (2015) has an excellent discussion of the legal issues surrounding this kind of augmentation, though much of it is speculative as the technology has not progressed far enough to be certain what legal precedents will apply. Brinkman (2014) addresses augmented advertising, particularly advertising which is designed to be offensive or annoying in order to coerce nearby residents to purchase the physical property (and thus remove the advertisement.)

Fundamentally, the nature of augmented space both supports the idea that we should have some ethical rights over the space and makes determining how that should work difficult. On the one hand, we recognize rights over both physical property and virtual space. Since augmented reality is a blending of the physical and virtual realms, it seems unlikely that these rights would completely disappear. On the other hand, the very nature of augmented reality complicates the notion of rights because it is not clear how to translate them into augmented space; the rights we have recognized in physical space and virtual space do not entirely line up.

      a.   The connection to physical and virtual property

In most ethical theories we recognize some sort of rights over physical property. There are, of course, multiple ways of justifying this claim, depending on whether we take a Lockean view of property as a kind of natural right (Locke, 1689/1988) or a more contractarian view of property as arising from social agreements. (Rousseau, 1762/1997) Nevertheless, we generally recognize that depriving someone of their own justly held property causes a harm; similarly, interfering with the use of their property also causes a harm. Unless there are extenuating circumstances, I should not take your pencil, nor should I coat it in grease so that it is impossible to pick up and use. In both cases I would be interfering with your own reasonable use of your property.[8] This is also the case with respect to property rights over a particular space; I cannot ethically interfere with someone's use of their home unless I have some kind of reasonable cause.

Similarly, we recognize certain rights over virtual space and property. For instance, if you have a website you have certain rights to control its content; if your website is hacked and someone posts content that you do not like, you have a right to delete that content. This is akin to having a physical space such as a backyard – someone may throw trash into the yard, but you are not required to preserve it. Similarly, if someone posts spam on your blog or hacks into your website, you are generally not required to preserve what they have done. In both cases the "space" (whether physical or virtual) is something you can ethically restrict the use of.

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[8] Note that there could be circumstances where these actions are ethical; I could confiscate your pencil if you refuse to stop filling out an exam paper once the time has expired, say, and that would likely be ethical. Similarly, if I knew some maniac was going to shoot the next person who wrote a sentence with that pencil, it would probably excuse coating it in grease to prevent you from being shot (although this is likely not the most efficient way of preventing this occurrence.) These would both count as extenuating circumstances.

In a similar vein, persistent virtual worlds such as *Second Life* (Linden Research Inc., 2003) or *World of Warcraft* (Blizzard Entertainment, 2004) offer players the opportunity to acquire virtual property and objects. These items are often prized because they require considerable effort and/or game resources in order to obtain. For instance, players of *World of Warcraft* might need to kill a particular difficult monster many times or complete a long series of tasks in order to obtain an item. Users of *Second Life* might have to raise a lot of in-game currency in order to purchase a desirable parcel of virtual property. A number of legal cases (Glushko, 2007) have arisen from disputes over this kind of property. Litska Strikwerda (2012, 2014) discusses the theft of in-game objects as a kind of cybercrime which can cause real-world harm to players by depriving them of the fruits of their labor; while the objects may be virtual, the harm suffered is real.[9] We thus tend to recognize that people have certain rights to virtual objects that they have worked to obtain such that it is wrong to deprive them of those objects without just cause.[10]

Thus both in the case of physical and virtual property, we recognize certain rights of ownership or possession such that someone could unethically interfere with that property. Unfortunately, understanding how to extend these rights to augmented reality is somewhat tricky because an augmented object is neither purely virtual nor purely physical. For instance, consider *Pokémon GO* (Niantic Inc., 2016). As mentioned earlier, players of this game use an application on their phones to find and capture Pokémon; the application augments particular (real world physical) locations that the players go to and displays (virtual) Pokémon for the player to capture. This is a blend of virtual object and physical space.

Moreover, the ontology of augmented reality complicates matter. Virtual property or objects of the sort legal cases are concerned with exist within a virtual world which must be entered; it thus has a separation from the physical world. While *Second Life* has recreations of particular geographical locations and monuments within its virtual world, there is no strong connection between the physical place and the virtual place except perhaps for inspiration – one could experience that virtual content from many different physical locations, assuming one had an appropriate internet connection. Similarly, games such as *World of Warcraft* create their own fantastic settings which can be experienced from many different geographic locations. While a webpage or blog has a specific address, and in that sense has a location of a sort, again it is not strongly tied to a physical place. Moreover, in general the virtual location could be changed without diminishing its content – it needs an address so that people can locate the content, but its content does not depend on that address.[11]

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[9] Note that some objects can be obtained for real world currency, in which case the manner of obtaining them is not purely virtual.

[10] Of course, since most virtual worlds are hosted by private companies and players simply operate under an End User License Agreement, there is a good chance that technically they do not own the virtual property. How to handle this legally is a matter of much debate. (Cifrino, 2014; Glushko, 2007; Horowitz, 2007; Nelson, 2011) However, the fact that the company could decide that a player should not have access to a particular item (perhaps because it was obtained by violating the Terms of Service) is rather different from saying that another player can ethically take it. A player may not *own* an item or a piece of virtual property, exactly, but it is still intended to be used by that player and thus she may be harmed by its removal. The ethics seem somewhat more straightforward than the law in this case.

[11] Obviously this is a little simplistic; a blog that uses your name for its URL is easier to find than a random string of characters. However, the content itself in general does not depend on the URL. There are a few exceptions to this – for instance, if http://howdovaccinescauseautism.com/ lost its domain, the content of the page might have to be changed. But it could probably survive a minor alteration (howdovaccinesleadtoautism.com, perhaps) without

Augmented reality has both virtual and physical components – to experience the virtual content, one needs to be in a particular physical place. It is thus unlike virtual property or spaces because it is directly tied to locations in our geographic world; you cannot experience the content from afar. However, it is unlike regular physical property because of its virtual component – simply being in a specific geographic location will not be enough to experience augmented reality; one must also have the correct technology.

For example, consider the front yard of my house. Assuming you have normally functioning senses, if you are looking at the front of my house you will see the yard; both you and the yard are in the same physical space, which is sufficient. Yet you would not see any augmentation of the yard unless you accessed it using appropriate technology; both you and the yard are in the physical space, but the augmentation is not. However, if you had the appropriate technology but were too far away, you still would not see the augmentation because you were not in the appropriate physical location. This is different than if I wrote a blog post about my front yard and my mom read it from Nevada; she is in a different physical place but can access the virtual content because it does not depend on geographical location to access. Augmented reality functions quite differently than both physical and virtual spaces.[12]

The complicating factor is that the creator of the augmentation need not be the owner of the physical property. True, it is possible to dream up ethical dilemmas involving the augmentation of my own property. Building on the worries that Wolf, Grodzinsky, and Miller (2015) had about deception, perhaps in the future it would be possible to augment a piece of property so that it appeared to be in better shape than it actually was; I would thus be attempting to deceive a potential buyer into paying a higher price than it is worth. If augmented reality technologies got to the point where it was impossible to tell augmented reality from the real world, this sort of dilemma could easily arise. However, I suspect that they will more frequently occur when a piece of property has been augmented by someone other than its owner; in this case there is a divide between the virtual content and the physical property, and sorting out what rights the property owner should have is more difficult. Furthermore, the fact that frequently people augment public spaces, not simply private ones, adds an additional twist.

Despite these intricacies, the owner of the physical property still has certain rights pertaining to the augmentation of their property. However, what those rights are depends both on whether the property is private or public and how the augmentation is implemented. Essentially, augmented reality technology could develop in one of two ways. First, there could be a multitude of different apps which augment content; we would use different apps to experience different content. Second, augmented reality could be much more seamlessly integrated into our experiences, where users either do not have to consciously choose to experience the content or where users have converged on the same platform for content such that there is essentially a single augmented sphere that people access. In the first case, augmentations do not interfere

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requiring a content change. This is different from augmenting a physical space, where the virtual content is tied much more tightly to the specific geographic location.

[12] There is also a difference with intellectual property, which generally does not have a physical or virtual location of this sort; you do not have to be in a particular virtual world or in a particular part of the physical world to experience it.

with each other because they are contained on different platforms; in the second case, we have to worry about the possibility of overlapping content. I will consider the status of private property for each of these cases before turning to the question of public property.

   b. Private property

The most straightforward case involves the right to augment a piece of private property within a single sphere of augmentation. Recall that we generally view it as unethical to interfere with the owner's reasonable use of their property unless there is some overriding cause to do so. While an augmentation would be unlikely to interfere with the physical use of my property, it could interfere with my own ability to augment my property or my desires to have my property free of augmentation.

Consider the physical equivalent, which would be something like placing signs in a person's front yard.[13] I may place a sign in my front yard for a variety of reasons, ranging from acknowledging support of a particular political candidate to announcing the date and time of a yard sale that I am holding. If someone else places a sign in my yard, I am generally within my rights to remove that sign; I am not required to host signs supporting someone else's chosen political candidate, say. I may allow other people to place certain kinds of temporary signs – if my house is on the corner of two streets, someone else may place a sign with an arrow to their yard sale on my lot – but they generally stay only because I choose to allow them; if I needed to remove them in order to have work completed (or even because I am supremely grumpy) that would be ethically acceptable.[14] My use trumps the use of others who do not own the property; I have a right to post my own signs and to prevent others from posting theirs on my property.[15] In an integrated augmented sphere, augmentations seem to function much like these yard signs – there is a shared realm in which people can place content pertaining to a particular geographic location. As such, the ethical requirements seem similar; the owner's desires regarding which augmentation (if any) is permitted likely should take priority, barring some overriding social good.[16]

It is somewhat less clear how to deal with the case of private property if the augmentation occurs over multiple apps rather than in a single sphere. I tend to agree with Wassom (2015) that in such cases one person's augmentation is unlikely to prevent augmentation from another; since

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[13] Brinkman (2014) notes that we frequently use metaphors to describe technology, which can be problematic when the metaphor breaks down because there is not a strong enough parallel between the cases. Nevertheless, with the restriction to private property and a single sphere of augmentation, I believe the metaphor holds here.

[14] I would note that there are many reasons why I might wish to prevent the augmentation of my property in addition to grumpiness. For instance, an augmentation could interfere with the intended use of a property; this could have serious consequences in certain cases. Thus a hospital might wish to prevent unwanted augmentations from appearing in order to keep surgeons from being distracted, say. Similarly, a daycare center might not wish to have graphic depictions of violence augmenting their space, as it might discourage parents from entrusting their children to the center.

[15] Of course, the state's use may trump my use, such as if the road is going to be closed and road closure signs rest partially on my property; in that case, my use is subordinate to the greater good.

[16] At least at present. While this response to dealing with augmentations – sometimes called "geofencing" because it places a digital "fence" around the particular geographical area (Brinkman, 2014) – seems to align well with current ethical intuitions about property, Wassom (2015) discusses the fact that ultimately we might sell physical and digital development rights separately for something like a commercial space.

there are multiple ways to create and access the augmentations, there is much more space for multiple augmentations. While two people could still come into conflict if they wished to augment a space using the same platform, the lack of a unified sphere of augmented reality makes this less likely. Moreover, while it is plausible that the owner might still retain some precedence rights if they wished to augment using a platform, it is less clear that the owner has the right to be free of augmentation across platforms.

The reason why this case is somewhat different than the previous one comes down to the unavoidable nature of the augmentation in a single sphere. Assuming augmentation settles on a single platform (or even a very small number of platforms) and becomes popular, most people will likely use that platform. That means that most people who are walking down the street in front of my house will encounter the augmented content. This is why the parallel with signs in my front yard holds: in both cases, being in a particular geographical location makes it probable that I will encounter a certain kind of content.

However, if the augmentations are spread across many different platforms, then it is much less likely that a person will simply encounter content by happening to be in the correct geographic location. Instead, they will need both to be in the location and be using the appropriate application. This is no longer much like walking down the street looking a yard signs; it is much more like browsing for a particular webpage. Suppose a person were walking down a street and ran across a house with interesting architecture; moreover, the house is in a town's historic district. Stopping on the sidewalk to do a quick web search for information about the house's history would be perfectly ethical. Creating a web page with that information for people to find also would be ethical. This is not a perfect parallel for the augmented reality case – in the augmented reality case you do not need to search for each individual location – but it seems closer than the yard sign case.

This is not to say that any kind of augmentation would be ethical under these circumstances. For instance, businesses differed in their reaction to *Pokémon GO* (Niantic Inc., 2016); some saw it as a way of luring potential customers in and others saw players as interfering with their ability to serve their customers. If a popular augmentation is interfering with the intended use of the space then the owner is being harmed.[17] Similarly, an augmentation which posted virtual slurs on a person's house might also be unethical[18] as would an augmentation which involved posting confidential information. In these cases, whether the augmentation is ethical depends largely on whether it would be ethical to distribute that content in general; the augmentation is not truly introducing anything new into the ethical equation.

Other cases are less clear. Suppose a Jewish family makes no particular effort to hide their religion; they have a mezuzah by their front door, they have a menorah in one of their windows during Chanukah, and so forth. Essentially their religious affiliation is public knowledge to anyone who passes their house and is observant. Augmenting their house with religious information is thus not clearly an invasion of privacy. Augmenting their house via an app which was created with anti-Semitic intentions so as to single out Jewish people, however, is obviously more problematic. While the app is not providing confidential information, it is functioning as a

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[17] This would also hold true if the augmentation enticed people to trespass, as Wassom (2015) notes.
[18] Though possibly legal, unless it rises to the level of defamation.

kind of sign post to draw attention to particular locations. In this case, the app itself seems unethical to create, and thus any augmentations stemming from it will likewise be unethical. It is less clear, however, what to say about an app that simply notes the religions of the people occupying houses in a neighborhood – it could certainly be used for bad purposes, but the augmentation itself is not clearly unethical.[19]

Similarly, it is not clearly unethical to create an app that would allow one to view explicitly violent or sexual images superimposed on the world. Augmenting a day care with those images would likely strike many people as problematic, however; it is not the content per se but the juxtaposition of the content and location. This is despite the fact that the children almost certainly would not have access to those images and, assuming that there is a fairly small niche market for this app, it seems unlikely to interfere with the day care's business. Nonetheless, the association of sex and violence with small children (or a place that small children frequent) is something that most societies frown on. While it is not clear that any harm is occurring as a result of this augmentation, the particular location seems inappropriate. In this way, augmented reality is not completely like a web page, even in the case with multiple platforms, because the need to tie the virtual content to a specific physical place will sometimes require us to consider whether the juxtaposition is itself ethical.

The case of augmenting private property, therefore, seems to turn on how AR technology is implemented. If users converge upon one or two platforms for augmentation – and thus augmentations are fairly public in nature – then the parallel between physical and virtual space is strong. Just as a person has rights over their physical property, so too should they have rights over augmentations to that property. However, if users are spread out over a multitude of apps, this parallel breaks down and it becomes less clear that a person has a right to prevent the augmentation of that property. The issue becomes particularly murky when considering augmentations which do not themselves seem unethical but which could be used for bad purposes or simply seem inappropriate for the given geographical context.

     c. Public property

The issue of augmenting public spaces adds a new wrinkle into the equation because we tend to believe that people have different rights in public places. I can throw someone out of my house if they bring up a particular topic of conversation in my living room; I cannot throw someone out of a public park for doing so – after all, it is not my park. Or at least it is not exclusively my park. Ownership of public places is complicated, since those places are owned by the state and thus (in a democracy at least) are owned by the people in some sense. Individuals thus have a greater claim to public space than to other people's private spaces.

Augmented reality across multiple platforms seems fairly similar in both the public and private cases. Instead of comparing the augmentation to a website, however, it might be better compared to a guidebook: it gives you information about a public place, and there are many to choose from, depending on your purposes. Issues about privacy violations seem less likely to occur, given the public nature of the space, and there would be plenty of room for multiple augmentations. There could still be unethical augmentations, particularly if the augmentation

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[19] Again, assuming that the information was not gleaned unethically.

interfered with the intended use of the public space; for instance, the Holocaust Museum in Washington, D.C. has encountered issues with people playing *Pokémon GO* in the museum. (Peterson) However, the public nature of the space actually seems to make this issue more straightforward, since public comments on a public space seem less problematic than public comments on a private individual (or her space.)

The case becomes much more interesting if we consider what to do about public property given an integrated augmented reality. If we have a national park or a public square, what kinds of augmentations would be ethical? Who should be permitted to augment the space? I see two possible answers, depending on whether we see augmentation more like speech or more like graffiti.

If we take augmentation to mimic speech in a public place, then it will presumably be a right that we largely wish to preserve. The state does not have the right to choose the topics of conversation within its public places. The fact that some of those conversations are virtual in nature would be irrelevant; the state cannot ethically choose the topic of your texts from a public location either. Of course, if many people wished to enter into the augmented conversation, it could be complicated to implement in a way that makes it possible to focus on a particular augmentation. In this case it would be hard to distinguish the speech from the noise, particularly since augmentations seem likely to persist in a way that spoken conversations do not. However, if augmentation is seen in this light, society will have to adapt to incorporate this new form of speech in public places.[20]

On the other hand, if we see augmentation as graffiti – albeit frequently helpful or interesting graffiti – then it seems more within the state's purview to control. With the exceptions of a few artists like Banksy, graffiti is seen as a nuisance, not something which benefits the public, and we do allow its erasure. In this case, augmentation would be something that could be prevented and/or removed as the state sees fit; while we protect speech in public places (in general), we do not protect all forms of action – there are things you are not permitted to do in a national park, and augmentation might simply be added to the list.

Part of the problem is that augmentations will likely be some of each of these. A person who goes about augmenting public places with photos of his genitals is essentially engaging in the visual equivalent of spam – this sort of augmentation seems akin to graffiti. A person who augments a place with historical information seems more like speech. As for a person who augments a museum to tell you that their café serves terrible coffee, well, whether it is more like speech or graffiti in that case seems to be in the eye of the beholder.[21]

E. Conclusion

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[20] Perhaps it could be possible to make temporally-limited augmentations such that they expire after a certain period of time. This could at least cut down on the number of overlapping augmentations in a particular place.

[21] There's also an interesting question about whether there might be good reason to prevent augmentation of a particular space even if the augmentation itself is not problematic. For instance, perhaps a piece of public art should be experienced as it is, rather than having people view its augmentations and thus experience it only through the lens of pre-conceived notions.

Ultimately, the question of who can augment a particular physical space is complex. While we recognize moral claims to both physical and virtual property, there is not an obvious way to adapt these claims to augmented reality in all cases. In part this is because it is unclear how the AR technology will work. In particular, it is unclear whether augmentations will be accessed via distinct apps or whether there will be a primary AR app and thus users will have less choice about what augmentations they experience.

In the case of private property, the owner retains some rights with regard to augmented reality. Augmentations which interfere with the owner's use of the property are wrong to do, for instance. This is most likely to occur if there is a relatively unified sphere of augmentation such that one person's augmentation will prevent another's; in the case where there are a multitude of (as it were) competing platforms, rights are somewhat less clear. It is also unclear how to handle augmentations which are not clearly unethical in and of themselves but which may be problematic in a particular geographical context; further work will need to be done to explore the ethical ramifications of the interaction of the physical and virtual domains.

Public spaces raise additional questions. While augmenting them seems relatively unproblematic when there are competing apps, it is less straightforward if there is a single sphere of augmentation; augmentations have the potential to be seen as either potentially beneficial speech or as undesirable graffiti. Ultimately, a careful consideration of the potential benefits and harms to society that particular types of augmentation bring will likely be necessary.

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