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# XR Embodiment and the Changing Nature of Sexual Harassment

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**Abstract:** In this paper, we assess the impact of extended reality technologies as they relate to sexual forms of harassment. We begin with a brief history of the nature of sexual harassment itself. We then offer an account of extended reality technologies focusing specifically on psychological and hardware elements most likely to comprise what has been referred to as "the metaverse". Although different forms of virtual spaces exist (i.e., private, semi-private, and public), we focus on public social metaverse spaces. We do this to better explain how the concept of sexual harassment must be adjusted to such spaces and how approaches aimed at mitigating harassment must be sensitive to the type of metaverse spaces users utilize. We then offer a typology of sexual harassment for the metaverse focusing on three distinct forms of sexual harassment: (1) invariant (2) mixed variance or modified and (3) unique or metaverse specific. Although existing normative and legal frameworks may function well with respect to the first and, possibly, second forms of harassment, we argue such frameworks will not helpfully address metaverse-specific harassment. Ultimately, the changing nature of privately owned public spaces (POPS) which metaverses are likely to represent pose distinct ethical and regulatory challenges.

**Keywords:** augmented reality; applied ethics; extended reality; philosophy of technology; sexual harassment; virtual reality

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## 1. Introduction

Technology often changes our world faster than our laws and norms can respond to those changes. While usually benign, the consequences of reactive legislation can be harmful. For example, even though feminist activists had been writing about sex-based discrimination in the workplace throughout the 19th and 20th centuries, laws protecting people from harassment specifically based on their sex were not passed in the United States until 1964 as part of the Civil Rights Act.

Furthermore, it would take an additional decade before quid pro quo sexual harassment (SH), such as offering advancement in the workplace in exchange for sexual favors and discrimination on the basis of (actual or possible) pregnancy, were recognized by courts as forms of sex-based discrimination [1]. At best, reactive legislation can aptly address a society's changing needs. However, as the history of reactive SH legislation shows, it can also function to extend the suffering of those most in need of legal and social relief.

The introduction and widespread adoption of Internet technologies in the 1990s radically altered both the form and frequency of SH. Here, again regulation lagged behind the lived experience of the (often female) targets of misconduct. In 1998, the state of Michigan was the first in the US to charge someone with the crime of "online stalking" [2], and, in 2013, the state of California was the first to craft laws specifically prohibiting what is now called "revenge porn" (i.e., intimate photos or videos of a person shared by someone else without their consent for the explicit purpose of harassing or harming the person) (Cal. Pen. Code. §647(j)(4)). Decades had passed by that point since the widespread adoption

of social media technologies and policies aimed at curbing or mitigating harassment still await passage in many states to this day.

While the recent history of SH legislation represents a mixture of successes and regulative foot dragging, it offers us an opportunity to suggest improvements in how we think about, and regulate, SH in response to technological change. In this paper, we take a proactive (as opposed to reactive) approach to the regulation of SH. Specifically, we focus on understanding harassment as it is likely to occur within social extended reality (XR) spaces now collectively referred to as the metaverse.

We begin this paper by briefly defining both SH and the metaverse. We then move on to explain why the *kind* of XR space users find themselves in can matter when it comes to regulating SH. We then distinguish between three types of metaverse spaces: privately owned (by an individual); privately owned (by a corporation); and virtually or publicly owned public spaces to help us make sense of when, how, and why regulation of harassment can become complicated. Afterwards, we provide a typology for instances of SH in XR spaces. We also identify forms of SH unchanged by the shift to XR as organizationally invariant harassment, whereas other forms of SH modified by their occurrence in XR mixed-variance harassment.

We focus much of our attention on forms of SH which we believe to be unique to the metaverse and are especially ill prepared to regulate. These types of harassment are not currently covered by regulations (e.g., legal or corporate) focused on online or physical forms of harassment. We close this paper by considering the difficulties preventative strategies of XR harassment will encounter. One enduring challenge with regulating public spaces stems from the complex mixture of private ownership of spaces that are, ostensibly, open to the public.

## 2. Understanding Sexual Harassment

Early definitions of SH characterized it as "unwelcomed sexual [advances], or. . . unwelcome [requests] for sexual favours, or . . . other unwelcome conduct of a sexual nature in relation to the other person" [3] (206). For much of its history, SH was understood as a set of behaviors and practices that existed only in the context of the workplace. Catharine MacKinnon, an early advocate for the regulation of SH, provided evidence demonstrating the widespread nature of SH and claimed that seven in ten women experience SH in the workplace [4]. MacKinnon further argued that SH does not occur out of misdirected sexual desire; rather, it serves to maintain the status quo of systemic social inequality. As an early proponent of proactive legislation, she suggested implementing specific provisions to recognize SH as an issue independent from discrimination [3] (197)[1] [5].

Despite its relatively short history as a legal concept, the study of SH has developed rapidly. One well-known typology was purported by Azy Barak. Table 1 summarizes recent attempts to conceptualize SH Under Barak's analysis, SH can be classified as gender-based harassment, unwanted sexual attention, and sexual coercion [1]. Gender-based harassment, as the name implies, focuses insult onto a person on the basis of their gender. Examples include "behaviors such as posting pornographic pictures in public or in places where they deliberately insult, telling chauvinistic jokes, and making gender related degrading remarks" [1]. Unwanted sexual attention is a way of describing requests for sex or sexual favors instead of insult. Examples of this form of SH including all manner of "overt behaviors and comments, such as staring at a woman's breasts or making verbal statements that explicitly or implicitly propose or insinuate sexual activities" [1]. Lastly, sexual coercion goes beyond unwanted sexual attention in the sense that force (physical or psychological) or threat is used to elicit cooperation and "includes actual, undesired physical touching, offers of a bribe for sexual favors, or making threats to receive sexual cooperation" [1].

In online spaces (e.g., forums), SH occurs largely as either gender-based harassment or unwanted sexual attention (manifested through public or private messages). Furthermore, Barak specifically describes four distinct vehicles by which SH can occur: active or passive

*graphic* as well as active or passive *verbal* SH, respectively. While graphic and verbal harassment can occur in physical spaces as well, Barak's analysis helps us understand how SH can change its nature given the particular expressive options encouraged (or discouraged) by technologically mediated spaces.

Take, for example, Barak's analysis of a vehicle such as graphic SH (i.e., harassment involving sexual imagery) [1]. According to Barak, active graphic SH occurs when a user sends unsolicited and sexually explicit media to another user, whereas passive graphic SH is when an unsuspecting user encounters the aforementioned media within a site not purposed for explicit content. Similarly, active verbal SH occurs when a user directs harassing commentary (e.g., "You belong with the kids!") to another user, whereas passive verbal harassment is when a user displays harassing commentary (e.g., sexually explicit content within a user's username or profile) to potential receivers. As we expand upon in Table 3 near the end of our argument, it is important to note that our description of active, passive, graphic, and verbal SH are in terms of *vehicles* for SH. An instance of active graphic SH could be best conceived of as an example of what Barak would label "Unwanted Sexual Attention", "Gender Based Harassment", or "Sexual Coercion" depending on the specific content of the graphic displayed.

Given the frequently anonymous nature of online communication and the ease of direct and private communication enabled by social media, it is little wonder why active and passive graphic and verbal vehicles for SH are so readily encountered in these spaces. In physical spaces, such vehicles for SH would be more difficult to exhibit due to the spatial proximity required and because displaying sexual imagery is more likely to be reported or responded to.

As one example, consider the research emerging from Guo Freeman on the implications of what we will define as XR embodiment (i.e., the experience of being embodied in XR spaces).[2] According to Freeman [6], users embodied in XR spaces can come to feel a very real sense of identity with their XR bodies and can even feel as if those bodies are a part of their real or authentic selves. This sense of body ownership and virtual presence can be so significant it may impact the degree to which physical forms of SH become possible in XR spaces. In addition to her subjects' reported experiences of embodying a greater sense of presence, Freeman reports users experience "body tracking, synchronous voice conversation, and . . . simulated touching and grabbing" in ways that appear to mirror their physical equivalents [6] (6). We will refer to this phenomena as XR's capacity to generate "virtually real" experiences in the following section.

Freeman's data help us see how the technologies that make XR possible can alter how people interact with one another as a result of the possibilities for expression and interaction afforded by those technologies. In the next section, we articulate what these technologies are and the psychological and behavioral effects they can have on users.

**Table 1.** Causes and conceptualizations of SH along with XR extensions of the concept [7–16].

| Causes of SH[3] [16] | Conceptions of SH | SH in the Metaverse |
| --- | --- | --- |
| **Power Differentials [7]**<br><br>**Vulnerable Victims:**<br>SH is explained in terms of the power differentials between those targeted for SH and those engaging in it [8]<br><br>**Power Threat Hypothesis:**<br>Targets of SH are chosen because they represent threats to traditional patriarchal norms [9] | **Tripartite Analysis of SH [1]**<br><br>**Gender-Based Harassment (GBH):**<br>"unwelcome verbal and visual comments and remarks that insult individuals because of their gender or that use stimuli known or intended to provoke negative emotions" (79)<br><br>**Unwanted Sexual Attention (USA):**<br>"include behaviors such as posting pornographic pictures in public or in places where they deliberately insult, telling chauvinistic jokes, and making gender related degrading remarks" (80)<br><br>**Sexual Coercion (SC):**<br>"involves putting physical or psychological pressure on a person to elicit sexual cooperation. This category includes actual, undesired physical touching, offers of a bribe for sexual favors, or making threats to receive sexual cooperation" (80) | **Perpetrator, Avatar, Interaction Matrix [13]**<br><br>**The ethics of virtual sexual assault is dependent on the following factors:**<br><br>Who is *enacting* the assault (human v. virtual agent)<br><br>Who is *targeted* by the assault (human v. virtual agent)<br><br>The *medium* the assault occurs in (avatar–avatar interaction v. immersive space) |
| **Routine Activities [10]**<br><br>**Perception of Benefit:**<br>Targets of SH are (mistakenly) perceived as signaling receptivity [11]<br><br>**Opportunity:**<br>Enactors of SH are in positions in which they have multiple opportunities to engage in SH with little cost [12] | | **Experiences of SH in XR**<br><br>XR embodiment using avatars challenges conceptions of sexual coercion [14]<br><br>Experiences of sexual deception and consent are complicated by XR technology [6,13]<br><br>"Phantom sense" suggests the nature of XR experience is complex [15] |

## 3. The Metaverse

The potential for new types of interaction and identification enabled by XR technologies is cause for excitement from developers and enthusiasts alike. Before we survey the psychological and social effects these technologies can sustain, we begin by introducing the hardware. The goal is to motivate the claim that XR technologies can alter existing modes of communication and, in some cases, offer new ways of experiencing ourselves. Indeed, these technologies may alter how SH takes place within XR spaces as well as enable forms of SH that have not yet been fully explored, and for which our regulatory environment has not been built to respond to.

XR technologies are notable for the psychological effects they often have on users and for the unique hardware properties that enable those effects. In our terms, immersion is a way of speaking about the hardware that enables the experience of XR content [17]. For instance, the degree of immersivity a particular XR system has will depend on the particular hardware it makes use of. Immersion can be mediated by a system's graphical processing power; screen refresh rates; haptic feedback; head and gaze tracking; locomotive devices (e.g., controllers, handsets, treadmills, and hand tracking); and audio features. With virtual reality (VR) hardware, many of these capabilities are built into a head-mounted display (hmd).[4] Distinct from traditional (i.e., screen-bound) computing media, immersive technologies empower unique experiences.

Most famously, immersive hardware can generate presence, among the more powerful experiences enabled by XR. The experience of presence is sometimes described as a successful 'location' illusion, or the experience of being located inside a simulated environment as

opposed to wherever the user happens to be physically [17]. Presence is also often described in terms of creating an 'action' illusion, or the feeling of actually doing something albeit users are acting only in a virtual space [18]. Furthermore, experiences of presence have been associated with other psychological effects including the facilitation of "virtually real" experiences [19,20]. Although they are distinct from (albeit dependent on) experiences of presence, virtually real experiences are experiences perceived as if they were real during the moment of experience. While virtually real experiences are "highly present" experiences in the "doing there" and "being there" senses of presence, Ramirez and colleagues argue many highly present experiences fail to generate virtually real experiences[5] [21].

Hardware and software design features facilitating virtually real experiences play notable roles in how users experience social interactions within XR and, therefore, the possibilities these technologies may generate for SH. In the following section, we extend our analysis to include phenomena associated with user experiences of embodiment and socialization in XR.

## 4. Embodiment

Bodies matter for embodiment in XR experiences in several ways. Our bodies are often the targets of SH, but they are also the vehicles through which we understand ourselves and our social interactions. In physical spaces, our experience of embodiment is a long studied phenomena [22,23]. Only recently have we begun to understand how users experience and associate with their virtual bodies. In XR spaces, it is important to distinguish between the user's physical body and the virtual representation of that body. For instance, in such spaces users may have greater, or lesser, degrees of freedom in terms of designing their XR bodies. We will refer to the experience of embodiment in these spaces via a virtual representation as XR embodiment. We will also consider evidence that suggests, in some cases, people in XR environments can have virtually real experiences of their virtual bodies.

To understand the range of XR embodiment, and the conditions under which virtually real experiences of those bodies can occur, we might imagine different environments where users can become embodied. On the one hand, we might have an XR game where all users take on a standardized character and thus have little power over modifying their XR bodies. For example, all users play the exact same hero (or villain) with the exact same virtual body. On the other hand, we can also imagine XR spaces where user customization is the rule.[6] Interestingly, when users enter XR spaces intended for social interaction and significant freedom to customize their XR bodies, they can form strong psychological bonds with those bodies. Guo Freeman, drawing on her research on avatar customization and user experience, has argued that "[by] giving the avatar a sense of personality, unique behavior, intentions, and style, an online user starts to understand and attach himself/herself to the avatar as a second self, as something to protect and worry about, as one's role in the virtual world" [14].

Additionally, hardware elements, especially full body tracking, enable not only presence and virtually real experiences but also the experience of XR embodiment. If designed well, avatars can move, talk, and act in real time with their users. Quoting a subject in one of her studies on XR embodiment, Freeman [14] noted that:

> With [social VR spaces like] Rec Room, when you're creating the avatar, you're actually looking at it and you can move around and turn around. It's truly an extension of you. If it's in a normal game, it's not as engaging.
>
> [14] (4)

We have suggested that XR spaces can facilitate virtually real experiences but these can, we claim, also include virtually real experiences of XR embodiment. While by no means a universal aspect of embodied XR experiences, users in Freeman's study reported identifying with their XR bodies so strongly that it made them consider altering their physical bodies in order to better represent their authentic self. Indeed, as a result of her experience with XR, one of Freeman's subjects later came to identify as a transwoman:

> . . . by using a feminine female avatar, I found that I was just more comfortable with that body, and it's kind of what I learned about my identity. That was the evidence to myself to consider which direction I wanted to take my actual body outside of the VR. If I found I was happy in VR about my body and I was not happy with my body outside of the VR, why not change it?
>
> [14] (5)

Importantly, subjects in Freeman's study can experience their virtual bodies as being as real to them as their physical bodies (and, as seen above, sometimes even more authentic than their physical bodies). Because SH often includes physical forms of harassment, experiences of XR embodiment are important to analyze. While Internet technologies have enabled us to reassess the nature of SH threats (e.g., realizing the similarities between physical and cyber stalking), XR technologies can complicate this picture further. Given the nature of XR embodiment and the possibility of identifying strongly with one's XR body along with the possibility of other virtually real experiences in these spaces, SH should be understood to have a distinctly physical (i.e., a virtually real) component in XR spaces.[7]

## 5. Social Elements

Among the more exciting features XR offers is the ability for users to socially interact in novel ways. For instance, many XR spaces encourage recreation, gaming, or virtual representations of touristic areas. In fact, these spaces are built to facilitate social interactions between users (and in some cases between users and human-like bots). Furthermore, in one study, Freeman and her colleagues found users experienced virtual distance in much the same way they experience physical distance:

> If one tries to be physically close to another user in social VR without asking for permission, the majority of our participants would consider it a potential form of harassment–because it disrupts the social norm of appropriate physical distancing. . . In the offline world, a stranger who attempts to perform similar uninvited intimate behaviors on another stranger without consent is often considered as a harasser. In social VR, people seem to hold the same understanding.
>
> [6] (11)

The scenario in the example above may be especially true of interactions that include usage of haptic devices allowing users greater ability to interact with one another in virtually real ways. Under many circumstances, we can begin to see how SH in metaverse spaces can mimic forms of SH in the physical world, such as through non-consensual touching (with or without haptic feedback). However, it is not always the case that users interact with human avatars while socially engaging in XR[8] [24].

John Danaher [13] offers a theory of sexual assault (a subcategory of SH) for virtual spaces that distinguishes between both the kind of space the assault takes place in and the type of agent involved in the assault. For example, just as bots exist within social media platforms (i.e., Twitter, Instagram, and Facebook), they also exist in the metaverse. In terms of agents, Danaher, following earlier theorists of virtual social spaces, distinguishes interactions between humans from interactions between bots. Bots, he claimed, can interact with users and the environment by taking on a virtual avatar and can function as targets or enactors of SH. Similarities between virtual bodies that are inhabited by users and human-like bots can make it difficult (and in some cases impossible) for humans in these environments to ascertain whether they are interacting with (or harassing) another human, or a human-like bot. Additionally, Danaher claims responsibility and mitigation for SH enacted by human-like bots, Danaher must take a different form from instances of SH enacted by other human users.[9]

While both users and bots pose potential dangers to SH in the metaverse, Danaher highlights how these "human-like" bots force us to reconsider how one aspect of SH—consent—can look and what it means to provide it. In the context of sexual relationships, human-like bots are "robots that are designed to provide an artificial facsimile of a

real human sex partner" [13] (4). Whether or not SH should be thought to occur between humans and human-like bots, or whether consent between these two forms of agents is possible, is an interesting question. In the following section, we argue the importance of the function of an XR space, and how it should be a vital consideration in future mitigation strategies for SH in XR.

## 6. Space in the Metaverse: Public, Private, Semi-Private, and V-POPS

We have outlined how XR technologies can generate virtually real experiences affecting not only how users feel about what they do (alone or with others) in virtual environments but also the relationship between a user's sense of self and identification with their physical and virtual bodies. As such, psychological effects of simulated experiences play an important role in our assessment of XR SH. To portray the importance of mitigation and regulation of SH, we first need to introduce an additional element to our analysis, the function of the virtual space itself.

Erica Neely [25] has argued issues of physical, online, and XR spaces can become fundamentally important when it comes to addressing questions about rights in those spaces. Neely focuses her analysis on property rights in the context of informational AR overlays users might create that alter spaces. Discussing privately owned physical spaces, Neely argues that "[in] most ethical theories we recognize some sort of rights over physical property…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" (13). Neely's claim is that online spaces have traditionally been treated as analogous to physical space in the context of property rights:

> …certain rights [also exist] over virtual space and property. For instance, if you have a website you have certain rights to control its 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.
>
> [25] (13)

Neely also accurately notes that "understanding how to extend these rights to augmented reality is somewhat tricky because an augmented object is neither purely virtual nor purely physical" (14). For example, whether or not someone has a right to apply an XR overlay over a private property without the owner's consent (especially if its content is something they would disapprove of) is a matter that has not yet been adjudicated by social norms or the rule of law. In what follows, we extend Neely's arguments to show why the nature of XR spaces can matter in terms of the normative and regulatory frameworks built to respond to SH.

There are many ways of distinguishing virtual spaces from one another, including degree of interactivity [26], the values of the communities that inhabit it [27], interaction with others mediated by avatars [28], or a combination of several of these features [29]. While these approaches all have merit, we focus on distinguishing virtual worlds on the basis of their stated function and ownership.

Table 2 summarizes how spaces can be identified in terms of who owns the space itself (i.e., private individuals, corporations, and the public) and the intended function of those spaces. Purely private functions are those functions to which the general public is not welcome to enter or participate in (e.g., a gathering at a private residence for invited guests, being onboard a naval warship). In contrast, semi-private functions are specific activities the general public is welcome to participate in for the sole purpose of engaging in that activity (e.g., entering a retail establishment to make purchases, logging on to a gaming server to play collaborative games). It should be noted that privately owned spaces with public functions are becoming increasingly common. Lastly, public functions are

non-specific and even more open. Spaces with public functions are spaces where the public is encouraged to enter for a wide-range of often open-ended purposes.[10] Additionally, public spaces are often owned publicly (e.g., local, state, or other civic institutions).

**Table 2.** A typology of space by function and ownership (privately owned public spaces (POPS) bolded).

| | **Privately Owned (Individual)** | **Privately Owned (Corporate)** | **Publicly Owned** |
|---|---|---|---|
| Private function | Private Home | Internal Meeting Spaces | Naval Warship<br>Public University Classroom |
| Semi-private function (function specific) | Private Game Servers<br>Retail Store | Gaming Servers<br>Dating Applications | Courtrooms<br>Event Spaces |
| Public function | **Beach access via private property** | **Corporate Parks "Horizon Worlds"** | Public Parks |

While many of these types of spaces exist in both physical and virtual forms, we focus our attention specifically on the XR equivalents of privately owned public spaces (POPS) [30], and refer to these as virtual privately owned public spaces (V-POPS). We also claim V-POPS creates unique challenges to the regulatory approaches typically taken by corporations (e.g., Twitter and Meta) toward user-generated content or behavior.

If virtual spaces are marketed and largely treated by their users as digital equivalents of public spaces, then it can be argued the content moderation policies in those environments should mirror legal regulations on behavior and speech in public venues as well.[11] Physical or virtual privately owned spaces with purely private or semi-private functions may choose to impose terms on guests that are more restrictive than those found in the law (e.g., a restaurant may bar its users from playing their own music while eating indoors). Against the preservation of the public nature of the environment, POPS however can have trouble balancing the profit-driven nature of the space, which encourages complex and often influencer-driven approaches to its moderation [31]. V-POPS inherit this conflict.

In the remaining sections of this paper, we put all of these concepts together in order to offer both a typology of SH for XR spaces and a first-pass at regulations aiming to curb harassment, especially XR specific harassment, in V-POPS. We begin by discussing forms of SH we call "invariant".

## 7. SH in XR: Variant, Invariant, and Unique Forms

We have argued that an analysis of SH in social XR spaces requires us to be sensitive not only to the limitations of existing conceptions of SH but also to the actual hardware properties and psychological effects that XR technologies introduce. Additionally, we have suggested that those who own a particular XR space as well as how those spaces are set up to function can matter when we think about regulating environments to mitigate the occurrence of SH. In this section, we put these ideas together to offer a typology of SH in social XR spaces.

Borrowing a term from David Chalmers [32], we argue some forms of SH are "organizationally invariant". Referring to the nature of virtual events, objects, and persons, Chalmers argues that something is organizationally invariant if it

> depends only on the abstract causal organization of the underlying system... A property such as being a calculator depends only on this organization, which is also present in a simulation, so a simulated calculator is a calculator. The same reasoning explains why a virtual calculator is a calculator.
>
> [32] (325)[12] [33].

To call a form of SH organizationally invariant is to say that the form of harassment will not change even though the medium (or vehicle) in which the harassment occurs can

change. Verbal or written SH is organizationally invariant in this sense. Unwanted sexual advances or gender-based harassment spoken directly to someone nearby, said during a conversation over the phone, discussed during a livestream, or expressed while in social XR are all instances of verbal SH despite distinct changes in medium.

Similarly, unwanted sexual attention that takes a graphic form [1] is invariant. Whether images are delivered in printed form, on PC monitors, or inside immersive virtual environments does not change the functional nature of the harassment. As Chalmers argues, invariant forms of SH depend only on the causal relationships between speech (or images) and their targets.

Other forms of SH can be classified as mixed-variance. Mixed-variance forms of SH have some of the same abstract causal relationships as their namesake but are impacted more strongly by the vehicle delivering the harassment (i.e., whether it is delivered physically, over the internet, or within a social XR environment). Lastly, we think some forms of SH are largely dependent on the vehicle and will be unique to XR environments. While we do not discuss every instance of SH in XR in this paper, Table 3 summarizes our proposed typology[13] [34–36]. Our aim is to offer this typology in the hopes of encouraging further research not only on SH in social XR spaces but to explore additional research to mitigate these (and other, still unforeseen) forms of SH.

**Table 3.** Varieties of and vehicles for Sexual Harassment in social XR spaces.

| Invariant | Mixed-Variance | Unique |
| --- | --- | --- |
| **Active Verbal SH**<br>(non-consensually spoken offensive sexual comments manifesting as unwanted sexual attention, gender-based harassment, or sexual coercion) | **Avatar Chasing**<br>(non-consensually tracking an avatar's movements and/or activity as a form of stalking) | **UX Harassment**<br>(when designers fail to provide fully inclusive embodiment opportunities for users that reflect problematic norms about acceptable and unacceptable bodies) |
| **Active Graphic SH**<br>(sending unsolicited, sexually explicit media to another user) | **Passive Verbal and Graphic SH**<br>(embedding sexually explicit language and media in contexts where it would not be expected) | **Embodiment Harassment**<br>(when a user takes control of another user's XR body to alter its presentation in non-consensual and sexually explicit ways) |
| **Written Harassment**<br>(offensive sexual messages either directly sent to a user or embedded in a virtual environment where it would not be expected) | **Physical Harassment**<br>(virtually real experiences of physical harassment) | **Pseudo-Allyship**<br>(embodying oneself as a member of a marginalized group in order to undermine or harass group members) |
| **Additional Concerns**<br>Physical Risk: decreased attention to one's physical environment places users at an increases user risk of many forms of SHAge Embodiment: XR embodiment allows users to engage in virtually real sexual acts with users (or bots) embodying child-like avatars | **Haptics Harassment**<br>(when another user takes non-consensual control of one's haptic devices) | **Deepfake Harassment**<br>(use of deepfake technology to harass others, e.g., taking on the appearance of a person's abuser to traumatize or coerce) |
| | **Sexual Deception**<br>(use of XR embodiment to deceive users about who they are engaging with) | |
| | **Body Blending**<br>(use of deepfake technology to create embodied revenge pornography) | |

Mixed-variance SH remains conceptually connected to physical and online forms of SH but can take on new or expanded manifestations because of the immersive or psychological aspects of XR. For example, physical stalking and cyberstalking are both forms of stalking albeit physical stalking might include activities impossible in online contexts (i.e., physically following someone around). Legislative criteria for stalking are thus written so as to include behavior that can happen in both physical and digital environments such as obsessional following, obsessive relational intrusions, obsessional harassment, unwanted pursuit behaviors, and intrusive contact [36].

Insofar as these unwanted behaviors can occur in social XR spaces, then stalking, as a form of SH, also happens in these spaces. Importantly, conceptions of stalking often focus

on the psychological effects that stalking behaviors have: "[c]onceptually, stalking may involve frightening, threatening, and harassing behaviors, suggesting a multi-dimensional construct rather than a unidimensional one" [37] (77). In defining SH behaviors (e.g., stalking, unwanted sexual attention, and gender-based harassment) partially in terms of their effects on their targets, we acknowledge that actions that make up SH can occur in varied contexts so long as those contexts are able to affect their targets in similar ways.[14]

The use of XR technologies can also put users at risk for physical SH. As the technologies stand today, XR devices often require users to use hardware designed to completely immerse them inside of simulated environments.[15] Users present within these virtual environments are less aware of events happening in the physical spaces they are located within; this lack of physical situational awareness comes with risks. For example, Michael Antonov, one of the founders of Oculus (now owned by Meta), was accused of sexual assault by someone who met him at a developers conference. The person accused Antonov of assaulting her while she was in the middle of a VR demo he had invited her to try [38]. While SH of this kind is not unique to XR technologies, the loss of physical situational awareness that XR technologies aim to cause increases the risk of someone engaged in a virtual environment to be harassed in the physical world. These risks need to be accounted for in a discussion of mitigation strategies for SH in XR.

Although we argue that certain kinds of SH taking place in the physical world can also take place in the virtual world, mixed-variance SH may be more strongly affected by a transition in the medium and therefore may require different legislation, rules, and or ways of thinking about them. We have previously discussed the use of immersive hardware (e.g., field of view, full body tracking, and headsets) to create virtually real experiences. While this XR specific technology is what often draws users in, it is also what can enable physical harassment to occur via this new vehicle.

Because users cannot physically touch one another, physical harassment might be thought as impossible in a virtual setting. However, there are two ways in which we argue physical SH can occur in XR spaces. For instance, the ability for immersive hardware to create a psychological feeling of presence combined with increasingly realistic haptics allows for a form of haptics harassment to occur. Haptics harassment happens when a user's haptic feedback devices are hacked by other users in order to non-consensually touch someone. Because haptic feedback can directly and physically stimulate the user, unwanted haptic feedback (whether caused by another user or human-like bot) with sexual intent can be classified as a (mixed-variance) form of physical harassment.

Another method in which physical harassment can occur in XR is through virtually real experiences. Even without haptic feedback, users who identify strongly with their XR bodies can have virtually real experiences of being touched. Zheng and her colleagues have reported users can feel a "phantom touch", or phantom sense—when they "feel the sensation as if they are their avatars, without any haptic technology" [15]. Upon being touched by another avatar in social XR, a user can experience phantom sense in that same location on their physical body: "when someone headpats me [in XR], it gives me a tingly feeling on my head" (3). Since a user may genuinely feel virtual touches with the intent to harass them, cases involving phantom sense also cause our traditional notion of physical harassment to be modified. Whether physically or mentally stimulated through the use of haptics or development of phantom sense, respectively, both physical and XR mediums can facilitate the event of physical SH.

XR technologies can also increase the opportunity for sexual deception to occur. In fact, avatar creation in XR makes this and other forms of SH more accessible. For example, not only do virtually real experiences make physical SH more possible, they make deception more natural. Since users may relate more to an XR persona rather than an Internet-based avatar, social XR interactions share similar psychological and social heuristics as physical interactions. Furthermore, many social XR platforms allow users significant freedom over their embodiment (i.e., being able to control how their avatars appear in terms of race and gender), making it possible for users wishing to deceive others in these environments to do

so more naturally. The cases below highlight effects the integration of technology and a changing medium can have on sexual deception.

In order to see how technology may introduce a mixed-variance into the nature of consent with respect to SH, consider two British common law cases: R v. Elbekkay (1995) Crim LR 163 Court of Appeal and R v Devonald (2008) EWCA Crim 527. What's interesting about this pair of cases is they demonstrate not only the basic point about sexual deception and its complications but also that the *medium* can affect the nature of the assault/harassment. In R v. Elbekkay, a man entered a woman's room while it was dark knowing he would be mistaken for her boyfriend. The two engaged in intercourse until the woman realized the deception and fought the man off. Although the defendant claimed that the sex was consensual, he was later found guilty of sexual assault. His deception nullified her apparent consent.

Widespread Internet access enables individuals to engage in high-quality video conferencing. These technologies also allow people to engage in a new form of sexual deception referred to as catfishing [39]. In R. Devonald, a father sought revenge against his daughter's ex-boyfriend by recording him engaging in sexual activities. The ex-boyfriend was under the illusion that he was engaging in mutual sexual acts with a woman named Casey. Casey, however, was being played by the father who had created an online profile based upon images and videos collected of another person. The father was found to have caused "another person to engage in sexual activity without consent".

In the first case, we have a physical (non-technological) case of sexual assault via deception. One person assaulted another knowing that they would be mistaken for someone else. The second case involves technologically mediated deception (traditional catfishing) where one person posed as another using images and videos to support their deception. Although both cases involve sexual deception, each used distinct mediums (i.e., physical vs. virtual) to facilitate the deception.

Our claim is that XR technologies will have similar effects on the nature of sexual deception as Internet technologies. In other words, the possibilities for XR embodiment can expand and alter the way sexual deception, as a form of SH, can take place. Since virtually real experiences are possible in XR environments and users can feel genuine ownership over their XR bodies, cases of sexual deception in XR environments are strongly analogous to sexual deception in physical cases.

Another mixed-variance form of SH enabled by social XR is a phenomenon we refer to as body blending. Body blending relies on two technologies common to XR: avatar embodiment and deepfake technology. Deepfakes are "hyper-realistic videos in which a person's face has been analysed by a Deep Learning algorithm, and then superimposed on top of the face of an actor in a video." Body blending, as a form of SH, can be leveraged to generate revenge porn [35]. Revenge porn usually occurs when someone distributes intimate images of another person without their consent in order to embarrass, shame, or harm them. Because deepfake technology can use "publicly available pictures or video material…to generate its own amalgamation of it" [35], body blending can be initiated even by strangers. Users attempting to engage in body blending can therefore use publicly available media to embody themselves in a deepfaked sexually explicit avatar of their target. Body blending, understood this way, should reasonably be understood as a form of revenge pornography. A victim of body blending may be subject to various forms of backlash due to the shareable nature of the content, including but not limited to tarnishing their reputation.

While invariant and mixed-variance forms of SH take pre-existing forms of harassment and apply them in the context of XR worlds, XR technology also allows opportunities for bad actors to engage in forms of SH unique to the medium. These forms of SH are distinct from invariant and mixed-variance forms of SH because they are made possible by unique features of XR technology and are enabled by the social XR spaces. What makes these spaces unique from physical spaces is the creative freedom users have in their XR embodiment. While the limitless and changeable nature of this form of embodiment gives

users the ability to represent themselves in the most authentic way possible, it also poses several issues in regard to SH. To better understand the unique elements XR introduces to SH, we will expand on forms of SH mentioned in Table 3, such as UX harassment and embodied harassment.

UX harassment is specific to XR spaces because it only occurs when interfaces allow users to design their own avatar. As a form of SH, UX harassment occurs when users are limited in the variety of physical features they can choose from (e.g., eye shape, skin color, and body type), which then narrows representation especially when avatar customization options that are available serve to enforce, or reinforce, specific cultural or gendered embodiment ideals. Although UX harassment need not be intended by designers, it is particularly harmful because it stresses the values of certain bodies over others and may reinforce other (ableist, racist, colonialist) norms in the process. By limiting options for body type representation, especially insofar as those bodies uphold values about sex, sexuality, and embodied aesthetics, XR harassment threatens to erase / minimize the identities of Black, Brown, disabled, and non-binary individuals [15].

UX harassment also has a short history in discussions of video game ethics. While customizable features have diversified over recent years, "female characters, LGBTQIA+ characters, characters with a physical disability, and characters with a large body type are represented at rates far below the demographic of the U.S. population, and female characters that are represented tend to be sexualized" [40]. Thus, UX harassment does not occur as a result of a particular user's avatar or subjective responses to their XR bodies, rather, it arises from structural choices made by designers about the user interface. Given the importance of embodiment in XR and the possibility of merging one's sense of self with their XR bodies, UX harassment emerges as an especially important form of SH in XR.

## 8. Conclusions

Technological developments in the 20th and 21st centuries have radically altered the spaces where we live, work, and socialize. In our assessment, we have argued for several claims. First, the nature of SH can, and must, change as technologies increase or alter how people can interact with each other. Second, the psychological effects of immersive XR technologies can induce virtually real experiences, especially virtually real experiences of embodiment, that must be considered in any theorization of SH in social XR spaces (i.e., the metaverse). Thirdly, SH in social XR spaces is best understood as falling into one of three categories: invariant, mixed-variance, and uniquely XR SH. Finally, especially with respect to who owns the space and what the space itself is meant to function as, we argued XR as a medium matters when it comes to an analysis of SH and mitigations strategies. Although our focus in this paper has been to produce a typology of SH for social XR spaces, issues of regulation loom large. The typology offered in this article is meant to help guide future regulatory approaches both to help identify forms of SH that require regulatory attention but also to highlight how the ownership of an XR space can impact the regulatory environment that makes sense within it.

Philosopher Luciano Floridi has noted that, in the 21st century, digital spaces (which also include social XR spaces) have become the places "where humanity spends more and more time and where more and more activities take place directly or indirectly, from education to work, from socialisation to entertainment, from commerce to finance, from the exercise of justice to political discussion, from research to journalism" [31]. At the same time, however, these spaces have been theorized primarily under the model of private ownership and have largely been left to regulate themselves.[16] Public physical spaces, including privately owned physical spaces functioning as public spaces (POPS), are held to much higher standards than traditional privately owned spaces with private or semi-private functions [29]. Floridi himself has argued digital spaces such as these "should be conceptualised and governed more like a condominium . . . rather than like a new frontier that can be appropriated and colonised by anybody, or like a space that belongs to no one, like the Moon" [31]. Although it is still dubious how Floridi's condominium model can be

best upheld, most POPS are currently treated in much the same way as publicly owned public spaces are treated. Future research should be directed in this area to help propose resolutions to the tensions between the existence of V-POPS, corporate control, and liberal democratic systems.

It remains a live question how we ought to treat V-POPS such as *Horizon Worlds*, *Rec Room*, and *VR Chat*. On the one hand, in creating and marketing these worlds as XR public squares, it can be argued corporations take on a set of responsibilities to abide as neutral arbiters in such spaces with respect to the content produced there. Semi-private spaces are permitted more flexibility in terms of the moderation of user behavior in part because they operate to carry out a narrow range of functions (e.g., sell merchandise, host a gaming arena, and carry out civil and criminal proceedings). While SH, in its many forms, can and ought to be regulated in V-POPS, this line of thought may place limits on such regulation if specific forms of audio or graphics would be viewed as forms of protected speech in traditional physical spaces.

Another response to these issues is to argue that V-POPS, as we are currently discussing them, should cease to exist. On this approach, corporations such as Meta, which owns the social XR space known as Horizon Worlds, should be treated as publishers of, and hence as liable for, the content and behavior its users engage in.[17] To treat corporate owners of these spaces as publishers of user content would radically alter content moderation, especially for virtual or traditional social media functions. This approach would introduce greater moderation of user behavior (and hence the possibility of more wide-ranging restrictions on SH) but would change the nature of social XR spaces from public to semi-private. Though beyond the scope of the current paper, these issues are imminent as we begin our first forays into living, working, and socializing in XR environments. We invite others to join us in efforts to address this challenge.

Historically, our understanding of SH and attempts to mitigate it have lagged behind technological developments that can change its nature. In many ways, social XR spaces are likely to become common places where we spend a notable amount of our time. It is in our collective interest to be vigilant about SH in all environments lest we repeat the reactive mistakes of the 20th century in coming to grips with, and mitigating, these harmful behaviors. A proactive approach to understanding SH as it may likely occur in social XR spaces is an important step toward robustly mitigating the harms such harassment can cause and to creating more ethical, and equitable, spaces for our future.

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## Notes

1 One turning point in the law was the case *Williams v. Saxbe*, where the court held that SH was considered discriminatory treatment against gender under Title VII. This was significant because rather than emphasizing sexual desires, the court focused on discrimination based on gender. In 1980, the Equal Employment Opportunity Commission (EEOC) created guidelines that expanded the interpretation of Title VII in regard to SH to have similar interpretation to discrimination on the basis of race and ethnicity which considers an act as discrimination when it "has the purpose or effect of unreasonably interfering with an individual's work performance or creating an intimidating, a hostile, or offensive working environment" [5] (5).

2 This can include physical alterations as minor as "filters" applied to make oneself appear blemish free, thinner, or otherwise more in conformity to local beauty norms but can also extend to graphical overlays that more radically alter the appearance of the self to others (i.e., to embody oneself as a cat, robot, or a cloud of mist).

3 This summary of causal theories of harassment is helpfully outlined in [16], from which this column of Table 1 was generated.

4 The hmd itself can affect the immersiveness of the system if its weight or fit intrude on a user's experience (diminishing its likelihood of generating presence).

5 Ramirez [21] has argued that XR simulations are more likely to generate virtually real experiences in users when such simulations are high in what he refers to as "perspectival fidelity" (a simulation's ability to recreate the user's real-life perspective) and "context-realism" (the degree to which a simulation's content cohere's with the user's expectations of real-world interaction). In more recent work, Ramirez [19] has also identified psychological dispositions that users bring to simulations that may make some users more likely, in virtue of those dispositions, to have virtually real experiences.

6 Even here, we can imagine greater and lesser degrees of freedom. Later, we will argue that creators of such spaces (specifically spaces with what we willll call public functions in the next section) have a moral obligation to allow their users to create bodies that reflect not only the full range of human embodied diversity but also embodiment options that extend into recognizable non-human forms.

7 Qingxiao Zheng and colleagues have coined the term "phantom touch" to describe phenomena where "users feel [virtual] sensation as if they are their avatars, without any haptic technology" [15]. In our parlance, we would describe this as a kind of virtually real experience of physical touch. Surprisingly, Zheng's research suggests that this can happen even without haptic feedback.

8 Interestingly, Ron Dotsch and Daniël Wigboldus [24] found that virtual distance can be used to study (very real) implicit bias. They created a virtual environment in which Native Dutch participants encountered bots whose avatars were racially coded to present either as another Native Dutch person or as a Dutch person of Moroccan descent. They found that Native Dutch participants kept a larger virtual distance between themselves and bots racially coded to present as of Moroccan descent than they did with bots coded to present as a Native Dutch person. This mirroring of implicit bias behavior is in line with our hypothesis that many XR experiences (even somewhat benign ones such as waiting at a virtual bus stop) can be experienced as virtually real and, furthermore, that virtually real racial bias (and, we think, SH) can occur in these spaces.

9 Danaher argues that "[i]f the wholly virtual agent committing the assault is specifically programmed by a human to perform such an act, then it will be easy to trace a line of responsibility back to that human programmer. If the wholly virtual agent has some degree of autonomy or artificial intelligence, if it is programmed by an organisation or team of humans, and if its behaviour is an unanticipated or unexpected outcome of its autonomy and intelligence, the situation might be a little more difficult. In that case, we may have a 'responsibility gap' opening up between the acts of the virtual agent and the decisions made by its programmers and creators"[13] (27).

10 Neely [25] recognizes the importance of regulation when it comes to what we would call privately owned and private function spaces on the one hand and publicly owned public function spaces on the other: "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" (14). Hers are important distinctions. We claim at the end of this paper that the regulatory environment becomes even more multifaceted when one introduces XR embodiment into virtual privately owned public spaces. As such, it is important to track not only the distinction between public and private ownership but also the functional nature of the (virtual or physical) space as well.

11 Although we focus specifically on sexual harassment here, the idea applies more widely to issues of speech, behavior, and appearance. Although beyond the immediate scope of this paper, we say more about regulatory questions in our conclusion.

12 Some [33] may take issue with this way of framing things and argue, instead, that a virtual calculator is a fictional calculator because it can never instantiate all the properties a physical calculator has. They might thus claim that XR SH can also never instantiate all of the properties a physical act of SH can have. As a result such a critic may sat that SH is impossible in XR and that only fictional SH can take place. We think this is a mistake for two reasons. First, although Juul may be right that a virtual calculator may only accurately represent features relevant to calculation but not, for example, a calculator's ability to double as an improvised back scratcher, we think the relevant properties in instances of SH are largely psychological or physical. We will show that these properties are possible in social XR spaces and thus that, qua act of SH, real (as opposed to virtual or fictional) SH can occur. Secondly, accepting Juul's argument runs counter to current conceptions of SH that recognize organizationally invariant forms of SH such as verbal harassment. It is irrelevant, we think, to SH whether the target of that harassment could realize all the properties of their harasser (like, for example, the fact that physical attackers are edible: they can be killed and eaten). Attackers may have such properties but, qua act of harassment, they are irrelevant to the reality of the action.

13 Litska Strickwerda [34] has argued that haptics harassment should be seen as a form of sexual assault: "A user could commit a virtual rape in a virtual reality environment involving a haptic device or robotics. Where in the case of a virtual rape in a virtual world, one user takes control over another user's avatar in order to make his or her avatar appear to engage in sexual activities the user did not consent to, in this case, one user would have to take control over another user's haptic device or robot so that s/he can give that user sexually laden sensory feedback to which s/he did not consent" (496). We treat what we call "Avatar chasing" as distinct from cyber stalking and physical stalking for several reasons. Avatar chasing can involve elements familiar to both physical stalking (following a user around from virtual space to virtual space in a way that mimics physical stalking given the psychological effects of XR embodiment) and also cyber stalking (tracking user posts, comments, and other social XR artifacts). Additionally, although we consider pseudo-allyship a unique form of XR harassment we can imagine cases of pseudo-allyship in physical spaces (e.g., undercover agents) but note that such cases are both more difficult to carry out and rarer

in physical spaces. They are also usually directed at groups organized around ideology rather than groups organized around identity. Age embodiment, though not necessarily a form of SH, can be used to engage in sexual deception, active or passive graphic harassment, and deepfake harassment [35,36].

[14] This remains true even despite the fact that people may respond quite differently to being the targets of SH. A person's responses to SH form an important, but only partial, component of our understanding of SH.

[15] This is less true of AR devices which aim to preserve a user's experience of the physical world around them (albeit augmented with simulated content).

[16] Some regulatory attempts have been nonetheless attempted. The EU's General Data Protection Regulation (GDPR) and the state of California's California Consumer Privacy Act (CCPA) both aim to protect user privacy and data in ways that naturally translate to XR spaces. One concern about existing legislation is that they are not tailored to the specific forms of data gathering made possible by XR technologies and are not well suited to proactively prevent forms of harassment (including SH) made possible by these technologies [citation omitted for review].

[17] In the United States, such an approach would likely require modifications to Section 230 of Title 47 of the United States Code which currently do not treat most spaces online as publishers of their users' content and hence does not hold them liable for such content. While seen by many as essential for the function of modern social media, alterations to Section 230 and reconceptualizations of the relative values of privacy and freedom of speech have been proposed (Moore 2016). It may also be worth taking Luciano Floridi's suggestion that such spaces "should be conceptualised and governed more like a condominium" [31] more literally, which would also require modifications to current regulatory frameworks for speech and content.

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