Consensual XR: A Consent-Based Design Framework for Mitigating Harassment and Harm Against Marginalized Users in Social VR and AR

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Abstract

Extended Reality (XR) technologies offer capacity for transformative social experience, but also the potential to exacerbate the already-prevalent interpersonal harms in social VR. While forecasting the prominence of virtual and physical harm through VR-to-AR social interaction, this paper advocates for the use of consent as a novel design framework to aid in the construction of XR technologies aimed at mitigating harm. We outline a three-step process for applying a consent lens to design of XR experiences: selecting a definition or model of consent, designing XR consent mechanics to support users in practicing consent according to said model, and assessing consent mechanics through user studies. We demonstrate the feasibility of a consent-based approach to design with a case study involving participatory design of consent mechanics in XR dating environments with women and LGBTQIA+ stakeholders.

Index Terms: Human-centered computing—computer-mediated communication—XR; Human-centered computing—Consent

1 Introduction

Extended reality (XR) devices have emerged as a promising technology with the potential to significantly impact society and become as synonymous as the iPhone or personal computer (PC). It is estimated that over 70.8 million people in the US will use XR technology at least once per month in 2023 [15]. Major companies such as Meta, Microsoft, and Apple are actively investing in the development of XR devices and exploring novel use cases for these devices. While it is exciting to observe major companies invest in extended reality as the future of human-computer interaction (HCI), there are unique harms that researchers and developers will have to mitigate to ensure that XR experiences are safe and inclusive of all user groups.

There is mounting evidence of novel and severe interpersonal harms in social virtual reality (VR) applications, which are poised to propagate in future XR experiences, including the risk of physical harm in AR interactions [35, 37]. Studies have indicated that online dating platforms are associated with instances of sexual violence and harassment in both online and physical-world contexts [1, 32] and have postulated on physical harm through VR-to-AR interaction across modalities [39]. VR dating applications are emerging now [7] such as Planet Theta, Flirtual, and Nevermet, which can serve as environments for new forms of sexual harm both in VR and in subsequent face-to-face interactions [22, 38].

Sexual harm is not experienced equally. Historically women and LGBTQIA+ individuals have disproportionately been victims [4]. We are beginning to see similar trends with computer-mediated sexual harm, such as in online dating [32, 40] and in social VR [9,22,38]. Effectively designing current and future XR environments for harm mitigation is thus essential for fostering inclusive and equitable user experiences.

The current state of XR design for mitigating interpersonal harm is in fledgling stages [36], marked primarily by platform policies against harassment and user blocking/reporting features that necessitate a user to first be harmed before such features can be used. There are also personal space bubbles [10, 25, 29] which render offending users invisible if they encroach on one's personal space–especially to intentionally harass one through groping of their virtual avatar or other visual artifacts (e.g., drawing phallic symbols). However users have indicated that the mere awareness that an invisible user is trying to inflict harm can still be traumatizing [38], and such a feature would be inapplicable in AR settings and physical bodies.

In this paper we propose *consent-based design* as an alternative framework for designing harm-mitigative social XR experiences. Consent–or voluntarily agreement to a particular act or behavior–is the defining quality of sexual violence and other interpersonal harms [4]. It has also featured heavily in best practices around sex within the LGBTQIA+ and BDSM communities [23,41], thus lending itself as a readily understood lens for designing XR experiences with such communities. We use the term consent-based design to impose an overarching design goal on social XR: to ensure that any XR experience is voluntarily agreed/consented to by the recipient user(s). We organize the consent-based design framework into three steps: 1) selecting a consent definition (what criteria must be satisfied for an experience to qualify as "consensual"?), 2) designing XR consent mechanics (design patterns that support users in practicing consent exchange), and 3) evaluating and iterating on consent mechanic design.

In the following sections we introduce the concept of consent from related disciplines and review how it has been applied to tangentially related HCI research. We then unpack the stages of the consent-based design framework and illustrate how it can be applied to social XR through a case study involving participatory design of consent mechanics in XR dating environments with women and LGBTQIA+ stakeholders.

2 Understanding Consent

Definitions and terminology for consent vary across fields and topic areas [2, 8, 14, 27]. Nonetheless, recent literature - particularly in its application to computing disciplines- converges on a conceptual definition of consent as voluntarily permission or agreement to a specific act or behavior [14]. The contexts in which consent has been studied and applied are wide-ranging. Perhaps most well known is consent to sexual activity given that the lack of consent is the defining criteria of sexual violence which, contrary to rape myths [4, 17] does not always happen through deliberate force. Rather, problematic consent practices –or the ways in which individuals give and perceive to receive agreement to sex - predispose individuals to becoming perpetrators and victims of non-consensual sexual acts without their realization. Examples include inferring consent to sex through unreliable nonverbal cues (e.g., clothing choice, a bikini picture on one's dating app profile), and assuming one is not allowed to deny consent due to perceived spatiotemporal norms (e.g., inviting a person to one's college dorm room late at night) [11, 24, 41]. Consent has also featured heavily in the legal literature, but in cases

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of sexual violence and more generally about legal contracts and other interpersonal disagreements [27].

There remains a lack of consensus over what precise criteria must be satisfied for an activity, behavior, or occurrence to be deemed consensual. In the literature on consent to sex one of the more popular consent definitions or models is affirmative consent, which broadly puts on the onus on initiators of sexual acts to receive overt agreement to sex rather than on recipients to overtly refuse [12,14,42]. Core tenets of affirmative consent have been abbreviated in the acronym FRIES: consent must be Freely given, Revokable, Informed, Enthusiastic, and Specific [14].

2.1 Consent in HCI

Consent has emerged as a contemporary framework for design and study of human-computer interaction (HCI) [42]. Some examples of how consent can be applied in HCI include: how to properly gain users' consent for data collection [35], consent methods for the collection of secondary data [33], contextual approaches to consent that consider the factors such as the task at hand and environment [8], research into the design of interfaces that (im)properly gather consent [31], and maintaining consent through the use in artificial intelligence models to inform users [35]. The standard for maintaining consensual interactions between human and computer has been the notice-and-consent framework [19], referring to a two-step process of making users aware of a consent request following by enabling the user's choice of whether to give consent to collection of their personal data.

Consent has also been applied to study and reflection on social media application design [12], interactions with non-player characters in sex-themed video games [18], and interactions with sex robots and other embodied devices [28]. Most germane to our topic of social XR, new research has studied consent practices of social VR users [21] and demands of prospective VR dating users for technology to scaffold consent exchange [38]. That work collectively shows that while users desire mechanics in XR environments to mediate exchange of consent to interpersonal behavior, the current state of XR design does not effectively support such consent exchange. We build on these findings by proposing a consent-based design framework that researchers and designers can apply to guide design and development of usable consent mechanics for a wide range of social XR experiences spanning the virtual and physical continuum.

3 Consent as a Lens for Considering and Address Disparities in XR Experience

There is the potential for users of XR technology to encounter various forms of interpersonal harm or disparities in the initial development of this technology. Due to the unique nature of XR and the currently limited use cases and high cost associated with the technology, the potential for access disparities between users is high [30], which could lead to a digital divide where certain populations are simply excluded from the opportunities offered by XR technologies. This has been seen in the adoption of VR devices, where potential users have been alienated from using the technology due to budget-friendly versions not offering an experience that compares to the higher-end devices. These lead to further divisions where XR experiences can pose challenges for individuals who do not fall into the traditional M-WEIRD (Male-Westernised, Educated, Industrialised, Rich, Developed) demographic [6,34]. People with mobility, visual, or auditory impairments may face barriers when navigating or interacting within virtual spaces [3,13], XR experiences may not adequately represent the diversity of its users and backgrounds, and a lack of diverse training could cause XR technology to perpetuate content bias and stereotyping that is already present in the physical world and in online communities today [20]. Without taking this into account, XR technologies could lead to misinterpretation among users, discomfort, and an entire population feeling disconnected from reality-enhancing technology.

While not mutually exclusive, oftentimes those who experience the most harm from technology, whether it be harassment through online platforms, data leaks, or unknown data collection, are those who never had a say in how the technology was developed [5,26]. For example, it is well documented that users who go about exploring worlds within virtual reality may run into users who will harass and grope their avatar's without a user's consent [9,36]. Some users may ignore this interaction because they do not resonate with their digital avatar, but other users that experience phantom touch or some combination of haptic gear may be able to feel that interaction. This is an example of how non-consensual interactions and features may be minor inconveniences for some users but could be harmful to others. This is where consent must be considered. When considering consent in the design of these interactions, perhaps there could be some way to design anti-groping features from the ground up so that those interactions could be negated entirely. It would not negatively affect those who are not affected but would be incredibly beneficial to the affected population. By analyzing disparities through the use of consent, researchers can address disparities of any kind in a comprehensive approach that integrates inclusivity, diversity, equity, accessibility, or a design focus of their choosing into the further development of XR. In working to actively minimize disparities, developers can create a more meaningful and ethical experience for a broad range of users.

4 Consent as an Avenue for Involving LGBTQIA+ Perspectives in XR Design

Within the realms of inclusion, diversity, equity, accessibility, transparency, and ethics, consent remains a vital topic, especially within queer and minority communities [23,41]. Applying consent as a design lens could aid in the development of technologies that are inclusive from their inception. As an example, one fairly well-documented case of queer individuals adapting applications to their needs would be through their modified use of dating apps. Prior to the production of more inclusive alternatives, LGBTQIA+ online daters tried repurposing dating apps as makeshift affirmative consent technologies for more transparent discussion of sex and consent practices to screen potential partners prior to meeting face-to-face [41]. Researchers have explored consent-focused design principles in VR and advocated for incorporating consent in VR design, suggesting that insight could be gained on how to design consensual interactions by directly involving members of the LGBTQIA+ community [21]. Moreover, since current design principles may inherently carry biases, there has been a growing call to develop design guidelines that are directly influenced by individual experiences, promoting safer and more inclusive virtual environments [39].

5 Consent-Based Design Framework for XR Experiences

How can consent be foregrounded in the design of XR experiences, particularly to support marginalized groups who are already disproportionately impacted by nonconsensual behavior? We organize the consent-based design framework into three steps: 1) selecting a consent definition (what criteria must be satisfied for an experience to qualify as "consensual"?), 2) designing XR consent mechanics (design patterns that support users in practicing consent exchange), and 3) evaluating and iterating on consent mechanic design.

5.1 Selecting a Definition of Consent

There is no universal conceptual definition of consent or criteria for which to qualify an experience as "consensual." This requires designers and researchers of consensual XR experiences to first select or create their own definition of consent and associated criteria. For instance, according to problematic perceptions of sexual consent by the general public consent "could" be defined through nonverbal behavior–one's clothing choice or a particular look given to another person [16]. On the other hand, it could be defined through a model advocated by public health organizations such as affirmative consent, which necessitates that consent has to be unambiguous and overt [12, 14]. In HCI a host of additional consent models sensitive to computer-mediated contexts have been devised, particularly in the domain of consent to personal data collection, which – if not already transposable to the social XR context – can serve as inspiration for new, XR-specific models of consent that researchers/designers may want to devise themselves or in consultation with stakeholders they seek to protect.

5.2 Designing XR Consent Mechanics

The benefits of selecting a consent model or definition are in delineating qualities of an interaction that must be satisfied for it to qualify as consensual. Or put another way: it enables clear criteria for which to clarify when interpersonal harm is occurring (i.e., when consent has indeed not been exchanged). Such instances can be focal scenarios for which to design consent mechanics, which are design patterns in XR environments and applications that enable users to practice consent exchange according to the chosen model/definition. We would refer readers to HCI literature on related contexts for formative examples of consent mechanic concepts–specifically: consent mechanics in VR dating environments [38], affirmative consent mechanics in mobile social media platforms [12], and consent mechanics for human-robot interaction adhering to the FRIES model of consent [28].

5.3 Evaluating and Iterating on Consent Mechanic Design

How well do the designed and developed consent mechanics in the previous stage scaffold consensual interaction? May they have adverse impact on users in some way? To answer these questions it is essential to subject formative consent mechanic prototypes to user evaluation. This could be in the form of usability sessions for early-stage feedback, experiments to compare the impact of consent mechanics relative to other safety tools, or diary studies in which users employ consent mechanics in recurrent XR-mediated social interactions. Researchers could also involve stakeholders more collaboratively in design and assessment of consent mechanics with participatory design, which we illustrate in the next section.

6 CASE STUDY: APPLYING CONSENT-BASED DESIGN TO XR DATING APPLICATIONS WITH WOMEN AND LGBTQIA+ STAKEHOLDERS

To demonstrate how to apply the consent-based design framework to XR experiences here to introduce an ongoing study using XR dating as a context to speculate on how social interaction with potential sexual partners across VR and AR can be designed to foster safety and mitigate harm. The lab involved 16 LGBTQIA+ stakeholders to articulate safety concerns in dating interactions that transition from VR into physical reality and how such concerns can be addressed through XR interface design. Women and LGBTQIA+ demographics are prioritized at this stage because they are overwhelmingly the victims of sexual violence and harassment (in general and in computer-mediated contexts like online dating and social VR).

During the facilitation of our study, users were asked to design dating interactions that they had experienced in the past, what were some positive and negative experiences they had taken from those interactions, and how they would use that to inform how online dating should proceed with the addition of XR devices. The key results from this portion of the study were to get individuals to think about the individual experiences that they would perceive as dangers within the dating environment. Upon completion of the initial exercise, participants were introduced to affirmative consent using the FRIES model to understand the theory behind a consensual interaction. They were then tasked with breaking down the experiences they had previously indicated as being points of potentially negative interactions in VR dating and designing a way that such interactions could have been made consensual. These exercises yielded multiple consent-based designs that were focused on combating some of the perceived dangers and allowed the researchers to compare the iterative designs step by step to map overarching patterns that appeared between one group of diverse individuals. For instance, while not explicitly stated by any particular participant, multiple designs were created that had an emphasis on maintaining gender-affirming interaction between queer individuals who may use VR dating as a way to express their gender in a way that they are unable to in reality. Another design theme that was formed through the analysis of multiple prototypes was different ways of proposing ways of implementing a virtual assistant whose sole purpose was to send gentle reminders to users who may be crossing one's boundaries around consent

As a result, all of the designs that participants produced were very specific to their own individual backgrounds. Consent played a key role in the design of these designs by being able to explain and identify how problematic behavior within VR dating could happen and then guiding the users through clear, understandable guidelines as to how a consensual interaction should take place. The method was also effective at determining gaps in existing consent models as well. There were multiple instances where participants were unable to determine how an interaction in the VR dating environment could meet the requirements of the FRIES model, leading participants to conclude that in some cases there are large gaps of information that cannot be obtained to make a truly informed consent decision (e.g., inability to determine "who" one's partner really is that they are giving consent to). While the methods used in this study pertained to XR dating, we encourage its use as inspiration for how a consent lens could be applied to other types of XR experiences with marginalized groups.

7 Conclusion

This paper highlights the potential role of consent (voluntary agreement to a behavior or experience) as a novel research and design lens within the context of XR technologies. The rise of Extended Reality (XR) devices presents immense potential for impacting society and revolutionizing human-computer interaction. However, it is essential to prioritize consent-centered design to ensure equitable, safe, and inclusive experiences for all users. By acknowledging the diverse backgrounds of users through consent-based design, developers can create technologies that respect users' autonomy and foster a safer and more just XR environment. Through a case study of XR dating technologies we demonstrate how engaging marginalized communities, particularly LGBTQIA+ stakeholders, with a consent lens can manifest novel approaches and designs for safety-oriented social XR experiences.

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