



**THE IEEE GLOBAL INITIATIVE ON ETHICS OF
EXTENDED REALITY (XR) REPORT**

**SOCIAL AND MULTI-USER
SPACES IN VR: TROLLING,
HARASSMENT, AND ONLINE
SAFETY**

Authored by

Michelle Cortese and Jessica Outlaw

Chapter Leaders

TRADEMARKS AND DISCLAIMERS

IEEE believes the information in this publication is accurate as of its publication date; such information is subject to change without notice. IEEE is not responsible for any inadvertent errors.

The ideas and proposals in this specification are the respective author's views and do not represent the views of the affiliated organization.

ACKNOWLEDGEMENTS

Special thanks are given to the following contributors of this paper:

Sara Carbonneau

Thommy Eriksson

The Institute of Electrical and Electronics Engineers, Inc. 3 Park Avenue, New York, NY 10016-5997, USA

Copyright © 2021 by The Institute of Electrical and Electronics Engineers, Inc.

All rights reserved. 15 December 2021. Printed in the United States of America.

PDF: STDVA25108 978-1-5044-8202-8

IEEE is a registered trademark in the U. S. Patent & Trademark Office, owned by The Institute of Electrical and Electronics Engineers, Incorporated. All other trademarks are the property of the respective trademark owners.

IEEE prohibits discrimination, harassment, and bullying. For more information, visit <http://www.ieee.org/web/aboutus/whatis/policies/p9-26.html>.

No part of this publication may be reproduced in any form, in an electronic retrieval system, or otherwise, without the prior written permission of the publisher.

Find IEEE standards and standards-related product listings at: <http://standards.ieee.org>.

NOTICE AND DISCLAIMER OF LIABILITY CONCERNING THE USE OF IEEE SA INDUSTRY CONNECTIONS DOCUMENTS

This IEEE Standards Association (“IEEE SA”) Industry Connections publication (“Work”) is not a consensus standard document. Specifically, this document is NOT AN IEEE STANDARD. Information contained in this Work has been created by, or obtained from, sources believed to be reliable, and reviewed by members of the IEEE SA Industry Connections activity that produced this Work. IEEE and the IEEE SA Industry Connections activity members expressly disclaim all warranties (express, implied, and statutory) related to this Work, including, but not limited to, the warranties of: merchantability; fitness for a particular purpose; non-infringement; quality, accuracy, effectiveness, currency, or completeness of the Work or content within the Work. In addition, IEEE and the IEEE SA Industry Connections activity members disclaim any and all conditions relating to: results; and workmanlike effort. This IEEE SA Industry Connections document is supplied “AS IS” and “WITH ALL FAULTS.”

Although the IEEE SA Industry Connections activity members who have created this Work believe that the information and guidance given in this Work serve as an enhancement to users, all persons must rely upon their own skill and judgment when making use of it. IN NO EVENT SHALL IEEE OR IEEE SA INDUSTRY CONNECTIONS ACTIVITY MEMBERS BE LIABLE FOR ANY ERRORS OR OMISSIONS OR DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO: PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS WORK, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE AND REGARDLESS OF WHETHER SUCH DAMAGE WAS FORESEEABLE.

Further, information contained in this Work may be protected by intellectual property rights held by third parties or organizations, and the use of this information may require the user to negotiate with any such rights holders in order to legally acquire the rights to do so, and such rights holders may refuse to grant such rights. Attention is also called to the possibility that implementation of any or all of this Work may require use of subject matter covered by patent rights. By publication of this Work, no position is taken by the IEEE with respect to the existence or validity of any patent rights in connection therewith. The IEEE is not responsible for identifying patent rights for which a license may be required, or for conducting inquiries into the legal validity or scope of patents claims. Users are expressly advised that determination of the validity of any patent rights, and the risk of infringement of such rights, is entirely their own responsibility. No commitment to grant licenses under patent rights on a reasonable or non-discriminatory basis has been sought or received from any rights holder. The policies and procedures under which this document was created can be viewed at <https://standards.ieee.org/about/bog/iccom/>.

This Work is published with the understanding that IEEE and the IEEE SA Industry Connections activity members are supplying information through this Work, not attempting to render engineering or other professional services. If such services are required, the assistance of an appropriate professional should be sought. IEEE is not responsible for the statements and opinions advanced in this Work.

TABLE OF CONTENTS

ABSTRACT	5
1. INTRODUCTION	6
2. UNDERSTANDING SOCIAL VR	6
3. HARASSMENT AND TROLLING IN SOCIAL VR	8
4. SOCIAL XR HARASSMENT AND ETHICAL INTERACTION DESIGN	9
4.1. GENERAL	10
4.2. DESIGN PRINCIPLES	10
5. CREATING SOCIAL NORMS IN SOCIAL VR	11
5.1. STORIES AND MYTHS	12
5.2. TRENDSETTERS OF BEHAVIOR	12
5.3. SIGNALS OF BELONGING	12
5.4. LANGUAGE	13
5.5. RITUALS AND CEREMONIES	13
6. REFERENCES	14

THE IEEE GLOBAL INITIATIVE ON ETHICS OF EXTENDED REALITY (XR) REPORT

SOCIAL AND MULTI-USER SPACES IN VR: TROLLING, HARASSMENT, AND ONLINE SAFETY

ABSTRACT

This report is the result of work within the IEEE Global Initiative on Ethics of Extended Reality (XR), a multidiscipline group of industry practitioners, ethicists, academics, researchers, educators, and technology enthusiasts. It has been written to focus on a wide range of ethical issues related to XR and the ownership of second lives. This report builds on work outlined in the “Extended Reality” chapter of the IEEE’s seminal ethics-focused publication *Ethically Aligned Design*. XR is a term used to broadly refer to a suite of immersive technologies including virtual reality, augmented reality, and spatial computing. The scope of this report is the exploration of ethics-related issues in terms of virtual clones and the right to your identity; the aim is to initiate expert-driven, multidiscipline analysis of the evolving XR Ethics requirements, with a vision to propose solutions, technologies, and standards in future updates. The set of recommendations within this report will hopefully contribute to industry conceptualization of socio-technological issues, highlight concreted recommendations, and lay the groundwork for future technical-standardization activities.

MONIQUE J. MORROW & MATHANA

CHAIR & VICE CHAIR

IEEE GLOBAL INITIATIVE FOR ETHICAL EXTENDED REALTY

1. INTRODUCTION

While social and multi-user XR experiences have only started to approach mainstream adoption in recent years, issues of harassment and user safety have already emerged. This is not surprising, given the already long history of users harassing others in online spaces in a variety of ways. Developers of massive multi-user online (MMO) spaces have had to pay particular attention to issues around user safety, but problems can arise in any online game or XR experience that enables user-to-user communication—whether text-based bulletin boards, online multi-user games, or in social immersive Virtual Reality (VR) chat rooms.

At its most extreme, these issues can involve the stalking, grooming, sexual exploitation, and even murder of minors. More commonly, it may simply involve users creating an unpleasant experience for other users. In the latter case, the market incentive may be enough to help companies consider issues around user safety; however, there is a strong moral case to be made for taking the user experience of other users into account when designing and implementing any multi-user experience. Creators of social VR for children or vulnerable adults will have additional pressures to ensure a safe experience for their users.

Noting that many of the issues have common ground with other forms of online interaction, consideration is given to the resources available to help developers and consumers concerned about problematic online communications. Specific or unique issues that relate to XR will also be discussed in greater detail.

2. UNDERSTANDING SOCIAL VR

A common use case of virtual reality is social interaction. This is referred to as Social VR, in which users have embodied interactions with one another through “avatars” that represent them in the virtual environment. While social VR spaces are commonly accessed through VR headsets, some of these spaces can also be accessed through 2D mediums like browsers or desktop apps. Social VR has a wide range of use cases. It can be used as a classroom for education, a conference space for presentations and social gatherings, or a dance floor for a party. Ultimately, the use cases for Social VR are limitless, as VR spaces can be modeled off any existing physical environment or entirely new space and interactions can be imagined and created. The primary benefit of Social VR is that it offers people an embodied way to connect with one another across distances. Using VR, friends and family members can talk over a bonfire, explore virtual environments, watch movies, or even play games together despite being physically apart. Whereas other mediums like phone calls or video conferencing are less immersive and experiential, VR creates an increased sense of co-presence through physical embodiment in a shared space [1], [2]. Another potential benefit of Social VR includes the potential to reduce carbon emissions by increasing the

reliance on virtual communication. Using Social VR instead of air travel for professional meetings or conferences, family reunions, or other regular gatherings that require a large number of people to travel could help reduce carbon emissions in the future [3]. Users have a substantial amount of control when entering a Social VR space. They can often choose between a public space with strangers or a private virtual space that is invite-only for people on their friend list. Or, in the case of Hubs by Mozilla, creating social spaces means generating a unique URL. Users can choose to send the URL to as many or as few people as they wish.

Current social VR experiences range from open-world social environments to social gaming experiences. Some of the key players in the arena of Social VR are as follows:

- **VRChat** is an open-world social arena with a wide range of locations to choose from (shrines, bars, homes, etc.). Users can create and visit one another's worlds. VRChat hosted the Venice International Film Festival, rebranded as Venice VR Expanded, during the COVID-19 pandemic in 2020 [4].
- **AltspaceVR** is a virtual social space dedicated to live shows, meetups, classes, and more. They aim to create entertainment and community in the virtual world. AltspaceVR is also the official host of the virtual Burning Man experience, for which they have won multiple awards [5].
- **Hubs by Mozilla** is a virtual space where friends can hang out, watch videos, or manipulate 3D objects; they are well-known for their accessibility from both headsets and browsers [6].
- **Bigsreen** is an embodied theatrical experience. They offer users the opportunity to watch their favorite shows and movies in virtual movie theaters with friends and/or strangers [6].
- **Rec Room** is a popular social gaming platform designed for youth. They offer a wide range of games from laser tag to paintball to disc golf to table tennis [6].
- **Echo VR** is a zero-gravity battle arena in which users can team up with friends or strangers against teams of AI or other players [6].
- **Horizon World** has not yet been released but is a Social VR experience in beta as of the time of this writing [6].
- **Half + Half** is an example of a niche virtual social space in which the avatars are colorful blob-monsters. Both the avatars and the environment are painted in soothing pastel palettes and the environments and games offered are equally playful. Voice interaction is limited to only selected friends [6].

The previous list represents a small sample of existing social VR experiences. There are now more than 150 experiences of varying sizes and popularity to choose from [7]. Since the onset of COVID-19, VR has increased in popularity. The Oculus Quest 2, in particular, made record-breaking sales for VR headsets in 2020 [7]. Furthermore, VRChat's average player base has doubled since the onset of the pandemic while Rec Room's player base has more than tripled [8], [9], [10]. As trends from the pandemic, such as work-from-home and social distancing, resonate into the years to come, there will likely be an even greater increase in adoption and reliance on technology for communication, especially as the technology advances in quality and becomes more accessible.

3. HARASSMENT AND TROLLING IN SOCIAL VR

Many people who have used Social VR have reported safety issues. Harassment, trolling, and griefing are not unusual within public Social VR platforms, making the environments feel less safe and inclusive than is ideal for users. Harassment is defined as “behavior that demeans, humiliates, or embarrasses a person,” which includes but is not limited to obscenities or derogatory comments made about an individual’s race, religion, gender, sexual identity, nationality, or disability [11]. Within online games and platforms, users who harass other players are often referred to as “trolls” or “griefers.”

- **Trolling** is the act of intentionally instigating conflict, hostility, or arguments with the intent to provoke emotional responses out of people and disrupt otherwise civil discussion [12].
- **Griefing** is the act of deliberately irritating and harassing other players “within the game (trolling), by using aspects of the game in unintended ways, such as destroying something another player made or built” [13].

These more niche terms were created to describe the types of harassment that are prevalent in online social spaces and are used to illustrate the type of harassment more specifically being executed by the perpetrator. In a 2018 survey of 600+ Social VR users, researchers at The Extended Mind found the following incidence of harassment in Social VR [14]:

- 49% of women reported having experienced at least one instance of sexual harassment
- 30% of male respondents reported racist or homophobic comments
- 20% of males have experienced violent comments or threats

The full paper reports more fully on the prevalence of sexual harassment, racist and homophobic comments, and violent comments or threats by gender, as well as other user experiences and preferences within Social VR.

Because Social VR is typically accessed through headsets, the user is immersed within the virtual environment and is situated behind the eyes of the avatar, which they are using as a 3D representation. Likely due to this full body immersion, Social VR users have observed that VR experiences often provoke real-life survival instincts [15]. The body believes the virtual environment to be real and reacts in kind, which is what makes virtual roller coasters, skydiving, or plank walking so thrilling. The downside to this, however, is that harassment in Social VR is quite impactful and may be more akin to experiencing harassment in real life than it is to experiencing harassment online, though more research would need to be done comparing the impacts of these various types of harassment.

Anecdotally, however, some users have reported having their PTSD from prior assaults triggered by social harassment in virtual spaces [16]. This poses the question of what, if any, liability there is for the companies when harassment, especially toward vulnerable subgroups, is occurring within their virtual spaces.

The overall impact of these high rates of harassment is that women, in particular, do not feel safe in Social VR spaces [17]. In a small study ($n=13$) conducted on women in Social VR, it was found that only one out of thirteen participants is interested in purchasing hardware because women felt unable to express themselves and social norms did not exist to keep interactions within acceptable bounds [17]. This study was too small and limited in scope to make broad generalizations about women's experiences in VR, but it does indicate the need for more research around the safety of minorities' experiences within Social VR platforms. It is possible that other demographics who have similar experiences with harassment in Social VR spaces are also tentative to return. Due to the reported levels of harassment, as well as the subjective experience of harassment in Social VR [18], there may be an impact on the industry's ability to scale long-term.

4. SOCIAL XR HARASSMENT AND ETHICAL INTERACTION DESIGN

4.1. GENERAL

Ethical design is a complex and large area, but this section will focus on the ethical connection between interaction design and harassment on Social VR platforms. Ethical design is user-centered or human-centered, meaning that the design work is governed by the needs and problems experienced by users, instead of a primary focus on what is technically possible and economically viable. Ethical design should primarily deal with actual problems. Sometimes the best solution is no solution at all, which means that a critical design stance is vital. Ethical interaction design should be inclusive (possible to use for a wide range of users); easy to use (primarily for beginners and intermediate users, and with attention to usability, learnability, and intuitive interactions); and should empower the user (by providing relevant, extensive, and clear feedback from the system and enable a high level of control over the system).

Looking specifically at harassment, this means that features built for avoiding harassment (such as mute control or bubbles) need to be easy to learn to use. The user needs to understand the feature exists, how to enable it, and what effect it will have. The latter can be especially challenging in social platforms, since a common uncertainty in beginner users is “how does it appear for others?” For example, if a user mutes someone, will that person know? Will others know? Further on, when the user has enabled a feature, it needs to clearly indicate its

status, both immediately after activation (so that the user knows that something has been changed) and also in the long run (so that the user can clearly see and understand a specific setting even many weeks or months later). This feedback should primarily use rich visual modeless feedback, meaning that it is unobtrusive but conveys all information that is needed, and does not require any action from the user (“modeless” means that the user does not need to take action to react to the feedback; the opposite is “model feedback,” for example, a pop-up window that needs to be closed manually). Additionally, user empowerment in this context also means speed. For example, harassment in text-based environments is mostly asynchronous, and muting and such is often not highly urgent. However, Social VR environments are highly synchronous and immersive, meaning that when harassment behavior occurs, it often needs to be dealt with as quickly as possible, preferably within seconds. This puts very high demands on the interaction design to be highly intuitive and efficient. It also poses challenges concerning user onboarding—should all users go through an introductory tutorial concerning harassment mitigation? What is the actual worth of this many weeks later? The question is comparable to procedures for other risk management such as what to do in case of a fire emergency, a burglar intrusion, etc. The risk is very low, so the user gets basically no training in the procedure, but when it happens the user still needs to know what to do.

Another aspect of harassment mitigation on social platforms concerns different hierarchies of roles, such as guest, host, and co-host. To achieve a high level of user empowerment, the system clearly needs to convey which different levels are available; what the differences are in their powers (for example, can a guest mute another guest? Can they ban another guest?); and which individuals in each situation have these different roles. A specific challenge concerns moderators and their visibility. In some situations, it can be an advantage to have invisible moderators (so that they more easily can survey and detect harassment), but at the same time, when a guest needs help from a moderator, then it becomes vital that the guest can very quickly identify and communicate with the moderator. There is no perfect solution to this, and different solutions can be preferable in different situations, but as mentioned previously, the system should clearly communicate its state, including, for example, whether moderators are invisible or not.

4.2. DESIGN PRINCIPLES

Some design principles to consider are as follows:

- **Treat virtual embodiment with the weight of physical presence.** When a user’s virtual body is threatened or violated, the brain can perceive it as real because the perceptual physicality of AR/VR gives harassers troubling new ways to attack [19].
- **Consider proxemics when designing and comprehending virtual space.** A social measurement

of distance from the body that can be used to define and comprehend space. Proxemics (a social measurement of distance from the body) can be used to define and comprehend all space—including virtual. Using proxemic space definitions, dialogues, and interactions akin to real world expectations can be applied into Social VR spaces and designs [20].

- **Always communicate consent.** To find these familiar interactions and dialogues, it is recommended to look at consent acquisition paradigms in the real world. Once consent patterns are selected: set expectations, give agency, and enforce [21].
- **Provide quick-action remediation tools for tough situations.** Incorporate simple communication gestures and easy-access shortcuts to allow users quick-action remediation, allowing users in high-stress situations to quickly report a problematic experience without interrupting or further degrading their experience [22].
- **Allow users to define their preferences before social interactions begin.** Empower people to customize the types of experiences they are willing to have. Provide granular controls that are easy to access and surfaced before harassment can occur [21].
- **Establish local behavior expectations.** Introduce local behavior expectations in VR social spaces by creating conduct codes customized to the activities of the space and weaving them into the fabric of the space [23].

5. CREATING SOCIAL NORMS IN SOCIAL VR

There are many types of concepts and prototypes that could be employed to minimize harassment in virtual spaces. While there is a place for technologically engineered solutions, cultural approaches to minimizing are also critical to creating safe spaces. Because the culture of a place or group determines what behaviors are considered acceptable and what behaviors are considered unacceptable in each community, culture is a powerful tool for directing human behavior. When cultures outline acceptable behaviors from unacceptable behaviors, they create social norms that community members abide by individually and, often, enforce on the behalf of others. This creates a space that is safe through cultural norms and can act as powerful moderation tools. There are many elements of culture that Social VR creators can leverage to design culture for their virtual spaces. The sections that follow will outline common elements of culture and how these elements can contribute to creating safe virtual spaces.

5.1. STORIES AND MYTHS

Stories and myths are vehicles for dispelling values across a community. The stories that are imagined, as well as the stories that arise out of individual's actions and are cemented into myths and legends, indicate the shared values, beliefs, hopes, and fears within a community.

- **Stories** are narratives that use all the elements of culture (heroes, symbols, language, rituals, etc.) to display the values and acceptable behaviors within a community. They often illustrate the beliefs and behaviors that are *not* acceptable through foils and villains.
- **Myths** are stories that often discuss the origin of a community, or else foretell its future. They are a way of situating an existing community within history and often offer explanations for current belief systems.

5.2. TRENDSETTERS OF BEHAVIOR

Trendsetters of behaviors are heroes, mascots, and archetypes. These trendsetters act as role models and set the standard for the types of behaviors that are celebrated within a community.

- **Heroes** are the protagonists of stories and the character (usually) most celebrated by the audience. Their decisions determine which acts, behaviors, and choices are “good,” while their foil, the villain, outlines which actions are “bad.”
- **Mascots** are the embodied symbols of a narrative, community, or value. People rally around mascots to show their support for the group the mascot represents.
- **Archetypes** are stereotypical versions of a person. “The magician,” “the visionary,” “the trickster,” and “the creator” are all examples of archetypes. The types of archetypes that communities identify with can signal their values and beliefs.

5.3. SIGNALS OF BELONGING

People can signal their values and beliefs to one another using symbols and artifacts. They are a way of communicating shared values without words. This can make initiating a discussion feel easier or safer because there is a known commonality. In the case of harassment, such symbols can help people who belong to vulnerable populations find people with shared beliefs within Social VR spaces.

- **Symbols** “indicate status, role, belonging, mystical properties, cultural differences, and more” [24]. Most commonly, they indicate belonging to a community or group.

- **Artifacts** are items collected by people in exchange for currency or participation. Band t-shirts, conference tote bags, and “rewards” in video games are all artifacts that indicate a person’s participation, interest, and dedication to a group, community, or cause.

5.4. LANGUAGE

Language and jokes are a key means of communicating belonging, or lack of belonging, to a group.

- **Language** is foundational to any culture and allows participation within the culture. Inability to speak a language is perhaps the largest barrier to participation in any given culture.
- **Jokes** signal who does or does not belong to in-groups. Inside jokes can create bonds across a whole community or between selected members of a community. Creating inside jokes can help increase members’ sense of belonging and solidify the community’s sense of identity.

5.5. RITUALS AND CEREMONIES

Rituals and ceremonies are how values are embodied and enacted. They bring ideas and beliefs into the world through actions.

- **Rituals** are acts that are performed on a regular basis. Things like brushing your teeth, getting to work on time, or taking baths are all rituals that can reflect values such as hygiene, timeliness, or relaxation.
- **Ceremonies** are rituals performed by a community to celebrate or honor a milestone in an individual or community’s life. Weddings, funerals, and holidays are all examples of ceremonies.

Existing Social VR spaces may have top-down cultures informed by a code of conduct or live moderators. Or, these spaces may have a bottom-up culture where defaults of behavior are set by users and may be largely informed by gamer culture. These elements of culture appear when groups of humans gather, stories get repeated, and norms get codified. In the case of Social VR where users log in from all over the world, users may not have a shared culture of understanding they are working from, but a unique culture will likely emerge.

As Social VR spaces become more popular, and more mainstream, creators can use these elements of culture to make the values of their social spaces apparent, and actionable, by their users. This would make it easier for users to decide which platforms to use based on which most closely align with their values and will hopefully help lower rates of harassment. If platforms do not take actions early to set the norms of what and who is celebrated, they

leave an important lever of safety practices unused and leave it up to the users to bring in their own existing stories, heroes, symbols, and more. More so, changing the culture after it is already established by users bottom up will be more challenging than doing this work at the beginning [25].

6. REFERENCES

The following sources either have been referenced within this paper or may be useful for additional reading:

- [1] S. Zamanifard and G. Freeman, “‘The Togetherness that We Crave’ Experiencing Social VR in Long Distance Relationships,” in *Conference Companion Publication of the 2019 on Computer Supported Cooperative Work and Social Computing*, 2019, pp. 438–442.
- [2] C. S. Oh, J. N. Bailenson, and G. F. Welch, “A systematic review of social presence: Definition, antecedents, and implications,” *Front. Robot. AI*, vol. 5, p. 114, 2018.
- [3] D. A. Le, B. MacIntyre, and J. Outlaw, “Enhancing the Experience of Virtual Conferences in Social Virtual Environments,” 2020, doi: 10.1109/VRW50115.2020.00101.
- [4] P. Graham, “Venice Film Festival Partners With HTC Vive, VRChat & Oculus For Digital VR Event,” *VRfocus.com*, 2020. <https://www.vrfocus.com/2020/08/venice-film-festival-partners-with-htc-vive-vrchat-oculus-for-digital-vr-event/> (accessed Sep. 20, 2021).
- [5] “BRCvr An Official Virtual Burning Man Experience,” *brcvr.org*. <https://brcvr.org/> (accessed Sep. 20, 2021).
- [6] R. Schulz, “Comprehensive list of social VR platforms and virtual worlds,” 2019.
- [7] “Interest in AR/VR grows during COVID-19 pandemic but market needs to evolve, says GlobalData,” *GlobalData.com*, 2020. <https://www.globaldata.com/interest-in-ar-vr-grows-during-covid-19-pandemic-but-market-needs-to-evolve-says-globaldata/> (accessed Sep. 20, 2021).
- [8] “RecRoomOriginal Games,” *Rec Room Wiki*, 2021. https://rec-room.fandom.com/wiki/Category:RecRoomOriginal_Games (accessed Sep. 20, 2021).
- [9] “Rec Room,” *STEAMCHARTS*. <https://steamcharts.com/app/471710> (accessed Sep. 20, 2021).
- [10] “VRChat,” *STEAMCHARTS*. <https://steamcharts.com/app/438100> (accessed Sep. 20, 2021).
- [11] “Harassment,” *Wikipedia*. <https://en.wikipedia.org/wiki/Harassment> (accessed Sep. 20, 2021).
- [12] “What is trolling?” *gcfglobal.org*. <https://edu.gcfglobal.org/en/thenow/what-is-trolling/1/> (accessed Sep. 20, 2021).
- [13] “Griefer,” *Wikipedia*. <https://en.wikipedia.org/wiki/Griefer> (accessed Sep. 20, 2021).
- [14] J. Oultaw, “Virtual Harassment: The Social Experience of 600+ Regular Virtual Reality (VR) Users,” *THE EXTENDED MIND*, 2021. <https://www.extendedmind.io/the-extended-mind-blog/2018/04/04/2018-4-4-virtual-harassment-the-social-experience-of-600-regular-virtual-reality-vrusers> (accessed Sep. 20, 2021).

- [15] J. Buchleitner, "When virtual reality feels real, so does the sexual harassment," *revealnews.org*, 2018. <https://revealnews.org/article/when-virtual-reality-feels-real-so-does-the-sexual-harassment/> (accessed Sep. 20, 2021).
- [16] Michelle Cortese, "Virtual Healing," *medium.com*, 2019. <https://medium.com/@ellecortese/virtual-healing-bf2b5f0cbf51> (accessed Sep. 20, 2021).
- [17] "Conferencing in Social Virtual Reality," *THE EXTENDED MIND*, 2019. <https://www.extendedmind.io/uist-virtual-conference-survey> (accessed Sep. 20, 2021).
- [18] L. Blackwell, N. Ellison, N. Elliott-Deflo, and R. Schwartz, "Harassment in social VR: Implications for design," in *2019 IEEE Conference on Virtual Reality and 3D User Interfaces (VR)*, 2019, pp. 854–855.
- [19] M. Slater, D. Perez-Marcos, H. H. Ehrsson, and M. V. Sanchez-Vives, "Inducing illusory ownership of a virtual body," *Frontiers in Neuroscience*. 2009, doi: 10.3389/neuro.01.029.2009.
- [20] E. T. Hall, "A System for the Notation of Proxemic Behavior," *Am. Anthropol.*, 1963, doi: 10.1525/aa.1963.65.5.02a00020.
- [21] M. Cortese and A. Zeller, "Designing Safe Spaces for Virtual Reality: Methods for Merging Body Sovereignty Theory into VR Design Practice," in *Ethics in Design and Communication*, 2020.
- [22] M. Dan-Cohen, "Responsibility and the boundaries of the self," *Harv. Law Rev.*, 1992, doi: 10.2307/1341517.
- [23] R. Schroeder, "Social Interaction in Virtual Environments: Key Issues, Common Themes, and a Framework for Research," 2002.
- [24] Jessica Outlaw, "The Pillars of Culture Creation in Social VR," *THE EXTENDED MIND*, 2020. <https://www.extendedmind.io/the-extended-mind-blog/2020/12/07/2020-11-30-building-culture-in-social-vr> (accessed Sep. 20, 2021).
- [25] A. Brown, "Organizational culture and leadership. Pitman, London," 1995.
- [26] J. Belamire, "My First Virtual Reality Groping," *medium.com*, 2016. <https://medium.com/athena-talks/my-first-virtual-reality-sexual-assault-2330410b62ee> (accessed Feb. 27, 2021).
- [27] J. Dibbell, "A rape in cyberspace," *Indep.*, 1999.
- [28] A. STANTON, "Dealing With Harassment in VR," 2016. <https://uploadvr.com/dealing-with-harassment-in-vr/> (accessed Feb. 27, 2021).
- [29] D. A. Le, B. MacIntyre, and J. Outlaw, "Enhancing the Experience of Virtual Conferences in Social Virtual Environments," 2020, doi: 10.1109/VRW50115.2020.00101.
- [30] J. Outlaw and B. Duckles, "Why women don't like social virtual reality: a study of safety, usability, and self-expression in social VR," *Ext. Mind*, 2017.
- [31] J. Outlaw and B. Duckles, "Virtual harassment: The social experience of 600+ regular virtual reality (VR) users," *Ext. Mind Blog*, vol. 4, 2018.
- [32] M. Cortese and A. Zeller, "Designing Safe Spaces for Virtual Reality: Methods for Merging Body Sovereignty Theory into VR Design Practice," in *Ethics in Design and Communication*, 2020.

- [33] R. Schroeder, "Social Interaction in Virtual Environments: Key Issues, Common Themes, and a Framework for Research," 2002.
- [34] M. Slater, "Place illusion and plausibility can lead to realistic behaviour in immersive virtual environments," *Philos. Trans. R. Soc. B Biol. Sci.*, 2009, doi: 10.1098/rstb.2009.0138.

RAISING THE WORLD'S STANDARDS

3 Park Avenue, New York, NY 10016-5997 USA <http://standards.ieee.org>

Tel.+1732-981-0060 Fax+1732-562-1571