

# Reawakening the Ghosts from the Past? Accessibility Lessons Learned from Second Life

Annika Kaltenhauser  
annika.kaltenhauser@unisg.ch  
University of St. Gallen  
St. Gallen, Switzerland

Johannes Schöning  
johannes.schoening@unisg.ch  
University of St. Gallen  
St. Gallen, Switzerland

## ABSTRACT

Recently, the need for a more inclusive and accessible Metaverse has become increasingly apparent. As a result, there has been a surge in efforts to explore potential solutions to this issue. To better understand the current accessibility challenges, we have taken a moment to reflect on past research conducted in the field of Human-Computer Interaction (HCI). Through a literature review of accessibility research in Second Life, a popular immersive virtual world during the Web 2.0 era, we analysed accessibility research (2008-2022, N=11 papers) presented at ACM SIGCHI conferences. The potential of accessible virtual worlds was already recognised in the Second Life era. However, we found that the solutions were only implemented as an afterthought and that in the future, we can draw more insights to build upon work from the past and other disciplines. We, therefore, highlight several critical aspects that were lacking and suggest opportunities and discussion points for future research in this field. Our goal is to help advance HCI research on the accessibility of immersive virtual worlds and prevent the pitfalls of the past. We believe that by doing so, we can create a more inclusive and accessible Metaverse without reawakening the ghosts from the past.

## CCS CONCEPTS

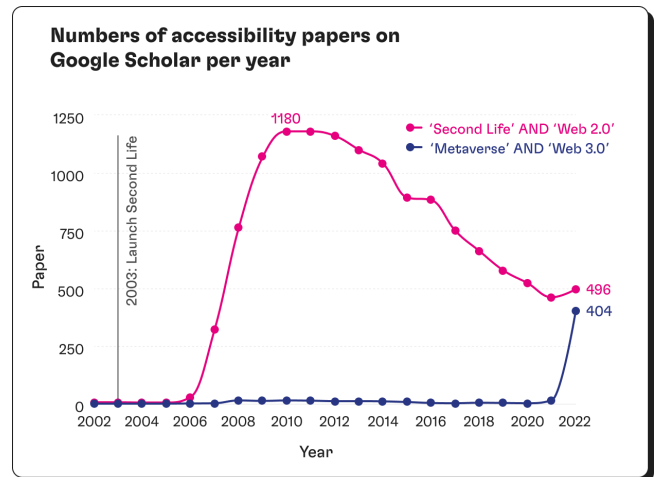
• **Human-centered computing** → **HCI theory, concepts and models; Accessibility theory, concepts and paradigms.**

## KEYWORDS

Human Computer Interaction, Accessibility, Metaverse, Second Life

## ACM Reference Format:

Annika Kaltenhauser and Johannes Schöning. 2023. Reawakening the Ghosts from the Past? Accessibility Lessons Learned from Second Life. In *CHI '23 Workshop: Towards an Inclusive and Accessible Metaverse, April 23–28, 2023, Hamburg, Germany*. ACM, New York, NY, USA, 5 pages.



**Figure 1: Accessibility paper<sup>1</sup> count over time elicited on Google Scholar with keywords 'Second Life' AND 'Web 2.0' in pink (■) and 'Metaverse' AND 'Web 3.0' in dark blue (■). The graph illustrates that despite the relatively recent emergence of research into accessibility considerations for the Metaverse, we have had the advantage of conducting research into accessible and immersive virtual environments, particularly in the form of Second Life, for nearly two decades.**

## 1 INTRODUCTION & MOTIVATION

“I’ve got a wheelchair in [it] also. You can choose whether you want to be in a chair or not. You can have crutches. You can have whatever disability you have in real life in [it]. [...] I find the attitude of people in [it] to people with disabilities is disappointing.”<sup>2</sup> As timely as these words may be in the discourse about an inclusive and accessible Metaverse, their origins date back to 2007 when a woman with cerebral palsy explained her virtual experiences

<sup>1</sup>Searching exclusively for accessibility documents, we have used the search terms described in section 2

<sup>2</sup>Excerpt of an interview found on YouTube: [https://www.youtube.com/watch?v=CBlaiBV\\_yJs](https://www.youtube.com/watch?v=CBlaiBV_yJs)

using Linden Lab's *Second Life*<sup>3</sup> (SL) as part of Web 2.0. On the one hand, her emotions and words captured in the video show the great potential that a virtual world like SL could hold for people with disabilities (PWD) [26]. However, it also reflects on its problems, such as experiences of (virtual) discrimination and accessibility barriers [7].

SL launched in 2003 and is one of the first and dominating (around one million users) social immersive virtual worlds advancing user-generated 3D content and virtual economy at its time [8]. Although SL does not have all the characteristics of a full-fledged Metaverse, such as decentralisation and interoperability [1], it is an important precursor to today's concept of the Metaverse. Within SL, users can create digital representations of themselves as human-like avatars, interact with other users, and explore a vast user-generated 3D landscape. Users can participate in various activities, such as live events, gaming, building property, and shopping. As evident from numerous scientific [2, 4, 6] and personal accounts in blogs [e.g., 5], vlogs [e.g., 7, 9, 23], and various disability communities' activities in SL [21] (e.g., Virtual Ability, GimpGirl support group, or Wheelies), people with diverse disabilities have participated ever since SL's beginnings.

It is noteworthy that even after two decades since the introduction of Second Life, there are still numerous accessibility challenges that persist in the development of immersive virtual worlds. The lack of a clear understanding of what a genuinely inclusive Metaverse might entail remains a significant hurdle in addressing these issues.


With the increased interest in research for an accessible and inclusive Metaverse [16, 27], as shown in Figure 1, we see an opportune time to reflect on our past successes and mistakes to gain insights for future efforts. While the HCI community generally drives the development of novel [20] and multisensory VR experiences [24], we want to understand, in particular, how HCI accessibility research can draw lessons from the past to shape the future of accessibility (research) for the Metaverse. We conducted a literature review and reviewed ACM SIGCHI conference articles that researched SL's accessibility (2008-2022, N=11 papers). This paper contributes by identifying opportunities for growth and recommendations to guide future accessibility research by 1) leveraging insights from past work and other disciplines, 2) creating an accessibility research roadmap, and 3) making accessibility research a top priority and thus can provide crucial information for decision-makers and developers to create an inclusive and accessible Metaverse.

<sup>3</sup><https://www.secondlife.com/>

## 2 METHOD & INITIAL RESULTS

As a starting point to draw lessons from accessibility research for SL, we looked at relevant Human-Computer Interaction (HCI) conference articles organised by ACM SIGCHI (ASSETS, CHI, CSCW, DIS, IDC, IUI, NordiCHI, OzCHI, TEI, UbiComp und UIST). We began by retrieving papers from the ACM Digital Library that have explicitly used the term "Second Life" in any place in the article, such as the title, abstract, or body of the paper. This first step retrieved 185 papers ranging from 2004 to 2022. Following Mack et al.'s approach [14], we further filtered for articles that included the word stems "accessib\*", "disab\*", "impair\*", or "assistive technolog\*" in their title, abstract, or author keywords. We arrived at a set of 18 publications (full-length and other types). In an initial review conducted by one of the authors, we:

- (1) excluded papers that did not meet our inclusion criteria
- (2) coded publications' accessibility-related population or community being studied using Mack et al.'s codes [14]
- (3) analysed the degree of engagement with the topic SL: part of motivation/part of related work/object of investigation

Our paper selection criteria included articles that specifically addressed 1) accessibility, 2) Linden Lab's Second Life platform, and 3) Second Life as an exemplar of a virtual world or Metaverse rather than solely as a popular or trending platform. We arrived at a set of 11 publications (full-length N= 9, late-breaking work N=1, student research competition N=1) [10–13, 15, 17–19, 22, 25, 28]. These 11 remaining papers (5.95 % of all SL publications) span 15 years, from 2008 until 2022: . As the sparkline depicts, the HCI community addressed research around accessibility topics related to SL mainly between 2008 and 2010 with six publications, which aligns with the first peak of accessibility research on SL seen in Figure 1. However, only five years after Second Life's launch. With a gap of six years, five papers were published between 2016 and 2022. The communities being studied in the publication are general disability (N=2), blind and low vision (N=5), autism (N=2), motor or physical impairment (N=1), and cognitive impairment (N=1). Regarding the degree to which SL is addressed, four papers touch on SL in their motivation, five consider one or more related SL work, and two papers report on SL as an object/environment of investigation.

## 3 RESULTS

Our initial literature review has also revealed a relatively narrow focus on accessibility issues pertaining to Second Life within the HCI community. Despite fifteen years of inquiry, we have observed

only eleven published papers across four of the eleven HCI conferences examined (ASSETS: 6, CHI: 3, UIST: 1, NordiCHI: 1). We note that only two of these publications specifically address Second Life as a research object or environment, and additionally provide contributions towards creating accessible artefacts for use within the platform [11, 15].

Folmer and colleagues [11] developed a text interface for virtual worlds called TextSL, in which users can use commands to navigate. Textual representation allows blind or visually impaired people to access Second Life with a screen reader. TextSL supports exploration via teleportation and environment descriptions, communication with other avatars, and basic object interaction. Building on this research, Oktay and Folmer’s work-in-progress [15] advances TextSL with a mechanism to synthesise the amount of feedback some users found overwhelming in a more meaningful and, thus, minimised form.

We also noticed that some publications in the field may not have given sufficient attention to accessibility concerns related to Second Life when now discussing accessibility concerns in the Metaverse and may have missed the opportunity to benefit from existing research findings in this area.

### 3.1 Learning from the past

In contrast, the recent work from 2022 by Kexin Zhang and colleagues [28] stands out as an excellent, albeit rare, example of considering and extending prior research: In their work on understanding avatar diversity and self-presentation for current virtual worlds from the lens of disability, they venture into rich examples from research from the Second Life era. Building upon the knowledge, they create evidence by reviewing popular social VR applications and in-depth interviews for PWD’s different disability disclosure strategies and preferences. Further, they derive design implications for more accessible and inclusive avatar experiences.

Another notable example for considering prior research from the SL era is Kathryn E. Ringland’s ethnographic work from 2019 [17]. In her work, she explores how physical and virtual spaces in Minecraft, specifically the so-called Autcraft community dedicated to users with autism, work together to make play possible. In doing so, she uncovers how the Autcraft community leverages a sense of place and digitally embodied experience to provide autistic children access to play with peers. Thereby, she introduces various work around disability communities in SL as related work, relates her findings to its previous insights, and extends her work within the Autcraft community presented in another paper in our data set [18].

In light of the high number of SL accessibility publications (see Figure 1), we had anticipated a much broader range of substantive accessibility considerations from the HCI community to learn from. Ultimately, since only two publications addressed accessibility research in SL, we believe it is even more essential to make accessibility issues a priority in the Metaverse. Overall, our data set consists of many insular views of distinct topics. Only two of the total 41 authors in our data set authored multiple papers (two publications each). Besides the work of Oktay and Folmer [15], just one other paper [25] cites an article [11] from within our data set.

### 3.2 Learning from other disciplines

Our data set does not include any empirical contribution, e.g., presenting field studies, interviews, focus groups or surveys for and around accessibility in SL. While other disciplines created much richer insights into accessibility in SL, they received little consideration in our data set. Three out of eleven publications cite the ethnographic report collected in more than two years of fieldwork of anthropologist Boellstorff [2–4] as related work. However, what is notably missing from these references to Boellstorff’s work are tightly coupled conclusions and (design) decisions based on his findings.

## 4 DISCUSSION & CONCLUSION

In order to guide the development of a more accessible and inclusive virtual world (known as the Metaverse), we analysed previous research on making immersive virtual worlds more accessible to people with disabilities. Specifically, we examined research conducted on Second Life as an example. Considering the high number of search results on Google Scholar (over 1100 hits per year at peak times, see Figure 1) compared to our data set of eleven relevant HCI conference publications in fifteen years, we notice that accessibility for and around SL is discussed mainly outside of the ACM SIGCHI conferences. Given the high number of accessibility papers across different formats and disciplines, before this literature review, we anticipated gaining many substantive insights to learn from accessibility research in SL for our current work on an accessible and inclusive Metaverse. For example, we expected to understand better PWD’s needs and accessibility challenges in immersive virtual worlds and to analyse patterns and trends in accessible solutions for SL. Based on our analysis of the example of accessibility research in SL, we believe these accessibility research activities did not tap into their full potential. Nevertheless, we are convinced we can learn three lessons from these experiences.

*Lesson 1 – No cold start needed:* Our literature review of eleven articles from the field of Human-Computer Interaction (HCI) revealed that researchers have only minimally utilised previous research, including work from other disciplines, to inform their studies. We recognise the potential value of leveraging accessibility research conducted during the era of Second Life, such as empirical studies conducted by disciplines like anthropology, pedagogy, psychology, and disability studies, to develop more accessible technologies and design solutions. However, little attention has been paid to this body of work as a foundation for improving accessibility. To ensure that our research agenda aligns with the needs of the disability communities we aim to serve, it is essential to gain a deep understanding of their needs. We propose incorporating significant findings from research on disability communities to identify what these communities need and demand to guide our research endeavors [14].

Although Second Life (SL) has been a widely used social virtual world for the past 20 years, it is essential to note that there are numerous other examples from which we can draw valuable accessibility research lessons. As researchers, it should be imperative that we draw inspiration from the rich results of previous virtual world accessibility research and research from other disciplines and utilise them as a foundation for refining our research questions and developing solutions. While novelty is undoubtedly an essential factor for publication acceptance at academic conferences, it can become problematic if it results in researchers starting from scratch with each technological wave, e.g. after two decades. We, therefore, suggest that authors and the HCI community carefully consider these trade-offs when generating and reviewing research to ensure that valuable lessons from previous research are not overlooked or ignored.

*Lesson 2 – Create a road map:* It is worth noting that the eleven accessibility papers we examined about Second Life covered a broad range of disability communities, including general disability (N=2), blind and low vision (N=5), autism (N=2), and motor and physical impairment (N=1). However, our analysis revealed that the majority of the solutions presented were isolated, and only a limited number of follow-up studies were conducted (N=2, as discussed in sections 3 and 3.1). To develop comprehensive accessibility solutions that align with the priorities of disability communities, it is essential to conduct research into community activities, such as interdisciplinary workshops and discussion platforms both within and outside the HCI community. This will enable us to collaborate and develop a roadmap for future accessibility research that is informed by the needs of these communities. Supporting Mack et al.'s point, we must carefully consider the full spectrum of people's disabilities

and other identities. Otherwise, accessibility research runs the risk of not being able to include critical, often multiply marginalised groups [14].

*Lesson 3 – Make it a priority:* Our analysis of all 185 papers on Second Life presented at ACM SIGCHI conferences between 2004 to 2022 revealed that only 11 papers addressed accessibility issues in Second Life. Among these 11 papers, only two made a meaningful contribution to the study of Second Life as an object or environment of research. While these contributions provided valuable insights, we believe that they fell short of providing comprehensive and definitive solutions to the challenges of creating an accessible and inclusive virtual world. As we reflect on the shortcomings of accessibility research during the Second Life era, it is important that we take steps to avoid replicating these limitations in future research endeavours. We must strive to develop more effective solutions to promote accessibility and inclusivity in virtual worlds [14].

To conclude, we argue that our learnings from reviewing accessibility research from the HCI community around Second Life, one of the first immersive virtual worlds, can help us question, discuss and shape our future accessibility research for an inclusive and accessible Metaverse. Our research has examined the ghosts of the HCI accessibility research's past. In a data set of accessibility research presented at ACM SIGCHI conferences (2008–2022, N=11 papers), we found that publications rarely embrace the opportunity to learn from past research and other disciplines to inform (design) decisions. Thus, we argue for a coordinated research agenda that does not repeat past mistakes, leverages insights from multiple disciplines, and makes accessibility in the Metaverse a top priority in the HCI community.

## REFERENCES

- [1] Mashaël Yousef Almoqbel, Azadeh Naderi, Donghee Yvette Wohn, and Nitesh Goyal. 2022. The Metaverse: A Systematic Literature Review to Map Scholarly Definitions. In *Companion Publication of the 2022 Conference on Computer Supported Cooperative Work and Social Computing (Virtual Event, Taiwan) (CSCW'22 Companion)*. Association for Computing Machinery, New York, NY, USA, 80–84. <https://doi.org/10.1145/3500868.3559448>
- [2] Tom Boellstorff. 2015. *Coming of Age in Second Life. An Anthropologist Explores the Virtually Human*. Princeton University Press, Princeton. <https://doi.org/doi:10.1515/9781400874101>
- [3] Tom Boellstorff. 2019. The Ability of Place: Digital Topographies of the Virtual Human on Ethnographia Island. *Current Anthropology* 61 (08 2019), 109–121. <https://doi.org/10.1086/704924>
- [4] Tom Boellstorff. 2020. The Ability of Place: Digital Topographies of the Virtual Human on Ethnographia Island. *Current Anthropology* 61, S21 (2020), S109–S122. <https://doi.org/10.1086/704924> arXiv:<https://doi.org/10.1086/704924>
- [5] Cassidy, Margaret. 2008. Flying with disability in Second Life. <https://www.eurekastreet.com.au/article/flying-with-disability-in-second-life>
- [6] Sandra Danilovic. 2009. Media review: Autism and Second Life—an introduction. *Journal on Developmental Disabilities* 15, 3 (2009), 125.

- [7] dingoaccess. 2007. wheeling in second life. [https://www.youtube.com/watch?v=CBlaiBV\\_yJs](https://www.youtube.com/watch?v=CBlaiBV_yJs)
- [8] John David N. Dionisio, William G. Burns III, and Richard Gilbert. 2013. 3D Virtual Worlds and the Metaverse: Current Status and Future Possibilities. *ACM Comput. Surv.* 45, 3, Article 34 (jul 2013), 38 pages. <https://doi.org/10.1145/2480741.2480751>
- [9] Draxtor. 2018. Our Digital Selves: My Avatar is Me [full feature film]. <https://www.youtube.com/watch?v=GQw02-me0W4>
- [10] Gerhard Fischer. 2010. Extending boundaries with meta-design and cultures of participation. In *Proceedings of the 6th Nordic Conference on Human-Computer Interaction: Extending Boundaries (NordCHI '10)*. Association for Computing Machinery, New York, NY, USA, 168–177. <https://doi.org/10.1145/1868914.1868937>
- [11] Eelke Folmer, Bei Yuan, Dave Carr, and Manjari Sapre. 2009. TextSL: a command-based virtual world interface for the visually impaired. In *Proceedings of the 11th international ACM SIGACCESS conference on Computers and accessibility (ASSETS '09)*. Association for Computing Machinery, New York, NY, USA, 59–66. <https://doi.org/10.1145/1639642.1639654>
- [12] Susumu Harada, Jacob O. Wobbrock, Jonathan Malkin, Jeff A. Bilmes, and James A. Landay. 2009. Longitudinal study of people learning to use continuous voice-based cursor control. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '09)*. Association for Computing Machinery, New York, NY, USA, 347–356. <https://doi.org/10.1145/1518701.1518757>
- [13] Sebastian Lieb, Benjamin Rosenmeier, Thorsten Thormählen, and Knut Buettner. 2020. Haptic and Auditive Mesh Inspection for Blind 3D Modelers. In *Proceedings of the 22nd International ACM SIGACCESS Conference on Computers and Accessibility (ASSETS '20)*. Association for Computing Machinery, New York, NY, USA, 1–10. <https://doi.org/10.1145/3373625.3417007>
- [14] Kelly Mack, Emma McDonnell, Dhruv Jain, Lucy Lu Wang, Jon E. Froehlich, and Leah Findlater. 2021. What Do We Mean by “Accessibility Research”? In *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems*. ACM. <https://doi.org/10.1145/3411764.3445412>
- [15] Bugra Oktay and Eelke Folmer. 2010. Synthesizing meaningful feedback for exploring virtual worlds using a screen reader. In *CHI '10 Extended Abstracts on Human Factors in Computing Systems (CHI EA '10)*. Association for Computing Machinery, New York, NY, USA, 4165–4170. <https://doi.org/10.1145/1753846.1754120>
- [16] Callum Parker, Soojeong Yoo, Youngho Lee, Joel Frederick, Arindam Dey, Youngjun Cho, and Mark Billinghurst. 2023. Towards an Inclusive and Accessible Metaverse. In *Extended Abstracts of the 2023 CHI Conference on Human Factors in Computing Systems (Hamburg, Germany) (CHI EA '23)*. Association for Computing Machinery, New York, NY, USA, 5 pages. <https://doi.org/10.1145/3544549.3573811>
- [17] Kathryn E. Ringland. 2019. A Place to Play: The (Dis)Able Embodied Experience for Autistic Children in Online Spaces. In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems (CHI '19)*. Association for Computing Machinery, New York, NY, USA, 1–14. <https://doi.org/10.1145/3290605.3300518>
- [18] Kathryn E. Ringland, Christine T. Wolf, LouAnne E. Boyd, Mark S. Baldwin, and Gillian R. Hayes. 2016. Would You Be Mine: Appropriating Minecraft as an Assistive Technology for Youth with Autism. In *Proceedings of the 18th International ACM SIGACCESS Conference on Computers and Accessibility (ASSETS '16)*. Association for Computing Machinery, New York, NY, USA, 33–41. <https://doi.org/10.1145/2982142.2982172>
- [19] Oliver Schneider, Jotaro Shigeyama, Robert Kovacs, Thijs Jan Roumen, Sebastian Marwecki, Nico Boeckhoff, Daniel Amadeus Gloeckner, Jonas Bounama, and Patrick Baudisch. 2018. DualPanto: A Haptic Device that Enables Blind Users to Continuously Interact with Virtual Worlds. In *Proceedings of the 31st Annual ACM Symposium on User Interface Software and Technology (UIST '18)*. Association for Computing Machinery, New York, NY, USA, 877–887. <https://doi.org/10.1145/3242587.3242604>
- [20] Peter Schulz, Dmitry Alexandrovsky, Felix Putze, Rainer Malaka, and Johannes Schöning. 2019. The role of physical props in vr climbing environments. In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems*. 1–13.
- [21] Stephanie Stewart, Terri Hansen, and Timothy Carey. 2010. Opportunities for People with Disabilities in the Virtual World of Second Life. *Rehabilitation nursing : the official journal of the Association of Rehabilitation Nurses* 35 (11 2010), 254–9. <https://doi.org/10.1002/j.2048-7940.2010.tb00056.x>
- [22] Shari Trewin, Vicki L. Hanson, Mark R. Laff, and Anna Cavender. 2008. PowerUp: an accessible virtual world. In *Proceedings of the 10th international ACM SIGACCESS conference on Computers and accessibility (ASSETS '08)*. Association for Computing Machinery, New York, NY, USA, 177–184. <https://doi.org/10.1145/1414471.1414504>
- [23] Virtual Ability, Inc. 2015. What Second Life means to me, with Gentle Heron. <https://www.youtube.com/watch?v=0ZKC4R81zzc>
- [24] Nadine Wagener, Alex Ackermann, Gian-Luca Savino, Bastian Dänekas, Jasmin Niess, and Johannes Schöning. 2022. Influence of Passive Haptic and Auditory Feedback on Presence and Mindfulness in Virtual Reality Environments. In *Proceedings of the 2022 International Conference on Multimodal Interaction*. 558–569.
- [25] Matt Wilkerson, Amanda Koenig, and James Daniel. 2010. Does a sonar system make a blind maze navigation computer game more “fun”? In *Proceedings of the 12th international ACM SIGACCESS conference on Computers and accessibility (ASSETS '10)*. Association for Computing Machinery, New York, NY, USA, 309–310. <https://doi.org/10.1145/1878803.1878886>
- [26] Denise Wood. 2009. Real Life Access to “Second Life” Worlds: The Potential, the Problems and the Possibilities for a Barrier-Free Future. *International Journal of Diversity in Organisations, Communities & Nations* 8, 6 (2009).
- [27] Jiangnan Xu, Konstantinos Papangelis, John Dunham, Jorge Goncalves, Nicolas James LaLone, Alan Chamberlain, Ioanna Lykountzou, Federica L Vinella, and David I Schwartz. 2022. Metaverse: The Vision for the Future. In *Extended Abstracts of the 2022 CHI Conference on Human Factors in Computing Systems (New Orleans, LA, USA) (CHI EA '22)*. Association for Computing Machinery, New York, NY, USA, Article 167, 3 pages. <https://doi.org/10.1145/3491101.3516399>
- [28] Kexin Zhang, Elmira Deldari, Zhicong Lu, Yaxing Yao, and Yuhang Zhao. 2022. “Its Just Part of Me:” Understanding Avatar Diversity and Self-presentation of People with Disabilities in Social Virtual Reality. In *Proceedings of the 24th International ACM SIGACCESS Conference on Computers and Accessibility (ASSETS '22)*. Association for Computing Machinery, New York, NY, USA, 1–16. <https://doi.org/10.1145/3517428.3544829>