PATHFINDER:

DESIGNING A MAP-LESS NAVIGATION SYSTEM FOR BLIND PEOPLE IN UNFAMILIAR BUILDINGS

BACKGROUND

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AUTHORS

These authors are affiliated with prestigious institutions and companies known for their work in Human-Computer Interaction (HCI), artificial intelligence, and accessibility research.

For example Cheiko Asakawa is a notable figure in the field of accessibility. She is well known for a Netscape browser plug-in she developed, the IBM Home Page Reader, it became the most widely used web-to-speech system available

PUBLICATION INFORMATION

- Conference: Presented at the 2023 CHI Conference on Human Factors in Computing Systems (CHI ’23), April 23–28, 2023, Hamburg, Germany.
- Publisher: Association for Computing Machinery (ACM).
- Context: CHI is a leading conference in HCI, providing a reputable platform for sharing groundbreaking research in this domain.

ABSTRACT

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The paper explores the development of PathFinder, a map-less navigation system designed to assist blind people in navigating unfamiliar buildings. Traditional indoor navigation systems rely on prebuilt maps, which are often expensive and time-consuming to create.

PathFinder addresses this by using real-time environmental data, focusing on detecting intersections and recognizing signs to guide users.

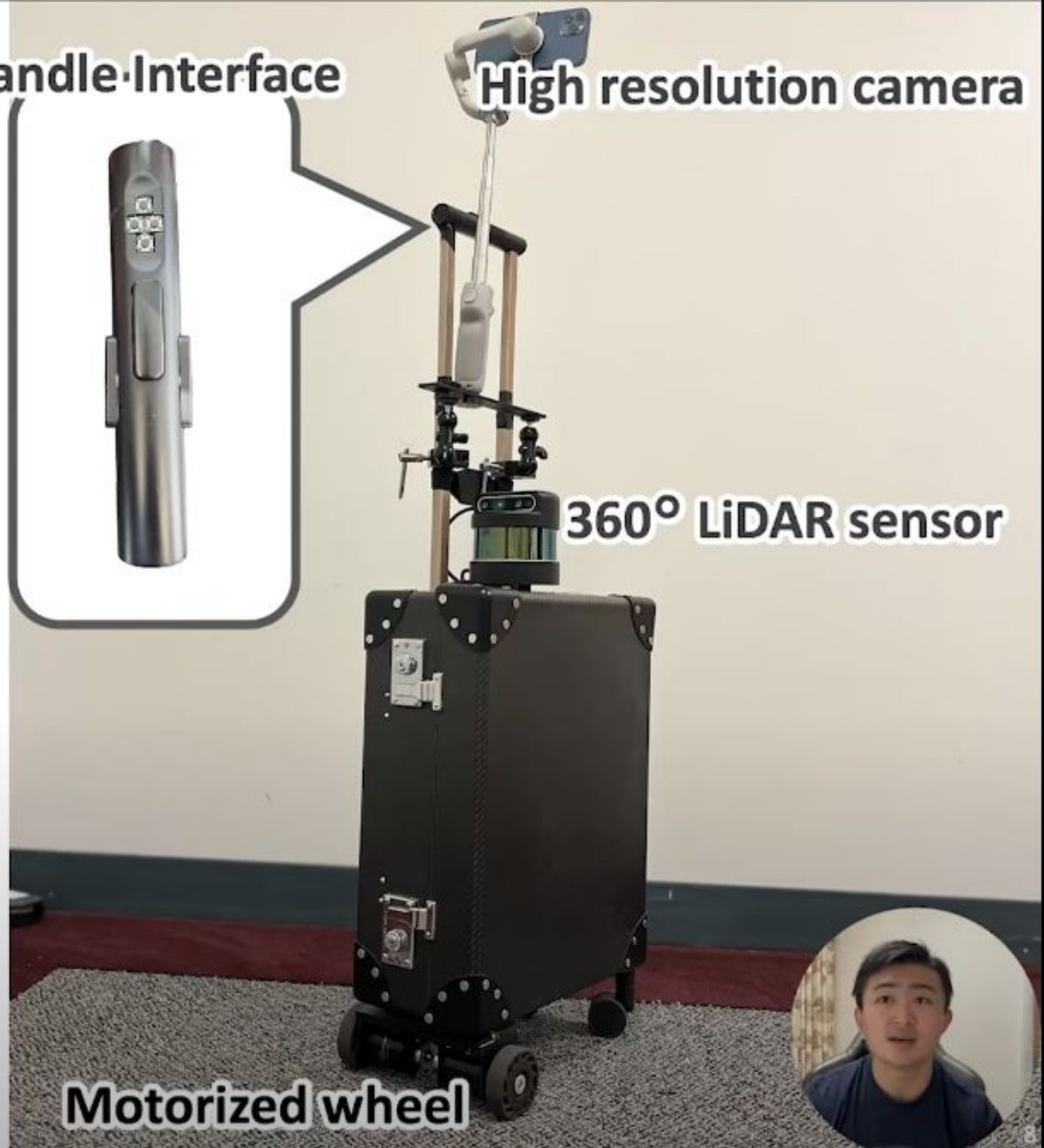
The system's design was iteratively refined through participatory design studies with blind participants.

The final prototype demonstrated increased user confidence and reduced cognitive load compared to traditional aids.

PathFinder

A map-less navigation system for

blind people in unfamiliar buildings



METHODOLOGY

RESEARCH METHODS

- The study employed a participatory design approach involving blind participants to identify the most useful environmental cues (such as intersections and signs) for navigation.

INTERSECTION DETECTION

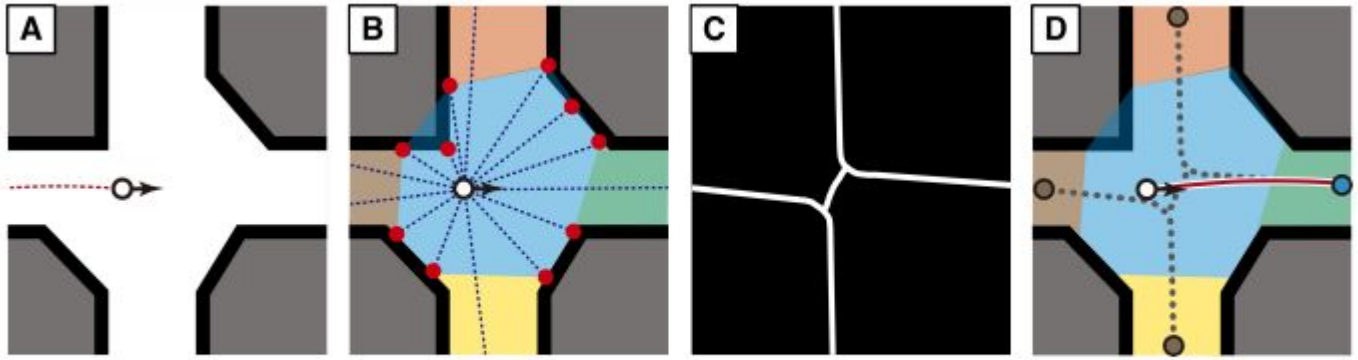


Figure 5: Steps for intersection detection: (A) Raw LiDAR map created by the system using SLAM (B) Detecting the closest convex hull similar to the method of Yang *et al.* [66] (C) Skeletonizing the regions outside of the convex hull to identify waypoints (D) Detected waypoints in the corridor regions, with the waypoint selected by the user shown in blue.

SIGN DETECTION

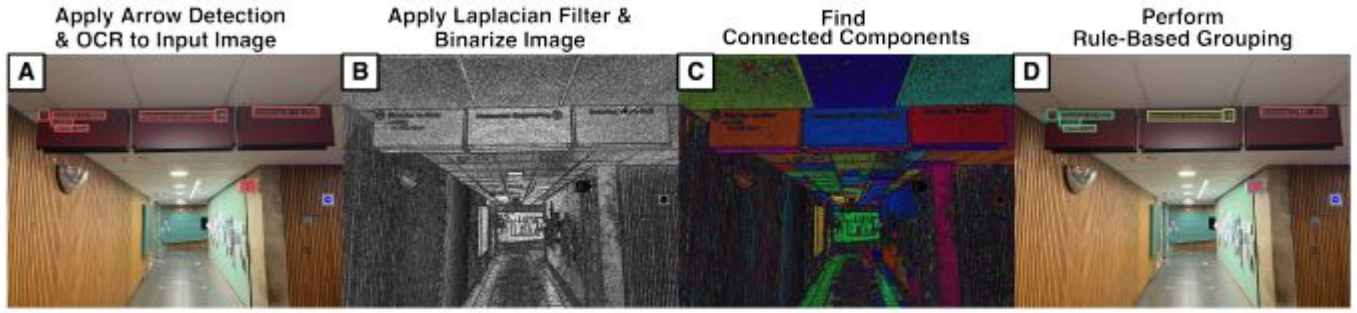


Figure 6: Our sign recognition module consists of four steps. The system first applies arrow detection and OCR (A), followed by Laplacian filtering and image binarization (B). Then the system finds the individual regions in the image using connected component analysis (C), followed by a rule-based grouping to associate the arrows and recognized text (D).

EXPERIMENTAL DESIGN

The research included two main studies:

- A **scenario-based study** with five blind participants to understand what information is most useful.
- A **user study** with seven blind participants to validate the system's usability and effectiveness.

RESULT FROM SCANARIO BASED STUDY

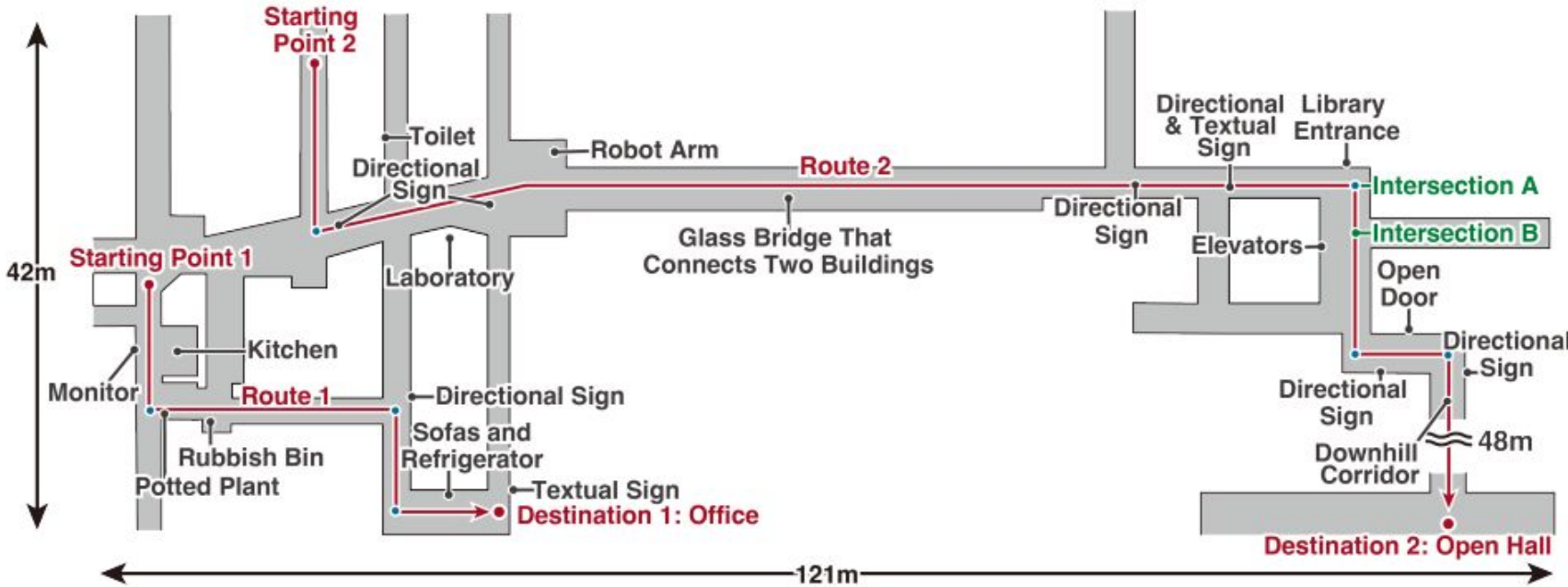
Table 1: Top three pieces of information and the number of intersections described by sighted passersby.

Route	Top Three Information in Route Descriptions by Sighted Passersby		Number of Intersections Described	
	For Sighted Questioner	For Blind Questioner	For Sighted Questioner	For Blind Questioner
R1	Intersections with directions (70%) End of the hallway (40%) Doors along the way (40%)	Intersections with directions (100%) Distance to walk (60%) Where the wall are (60%)	Mean = 2.0 Median = 2.0	Mean = 2.4 Median = 3.0
R2	Intersections with directions (100%) Downhill corridor (60%) Existence of the library (50%)	Intersections with directions (100%) Downhill corridor (60%) Distance to walk (60%) Where the wall are (60%)	Mean = 2.9 Median = 3.0	Mean = 3.6 Median = 4.0

USER STUDY

- The study had 7 blind people use different navigation methods to follow 2 different routes throughout the building.
  The first time they would use pathfinder and the second time they would use a pre-mapped system referred to as topline.

  If the participants used topline first it was expected that pathfinder would perform better as they would have experience with the route beforehand, this is why the order of conditions was not counterbalanced.



Route 1 description example

"Go straight, turn on the first left. Then go straight down the hallway until you meet the right corner. Basically, that's an end. Turn right there. Go straight. When you see a corner, turn left. If you walk straight for around 12 steps, you will see the destination with a specific room number in front of you."

Route 2 description example

"Go straight, turn on the first left. Then go straight down the hallway until you meet the end which leads to the right. Turn right there. Go to the next end which leads to left. Turn left there. Walk ten steps, turn right. Go all the way down the hallway. Once you reach an open space, you have reached the destination."

Figure 2: A floor map of the building where the study was conducted, showing the two routes, various POIs along the routes, and examples of the route descriptions.

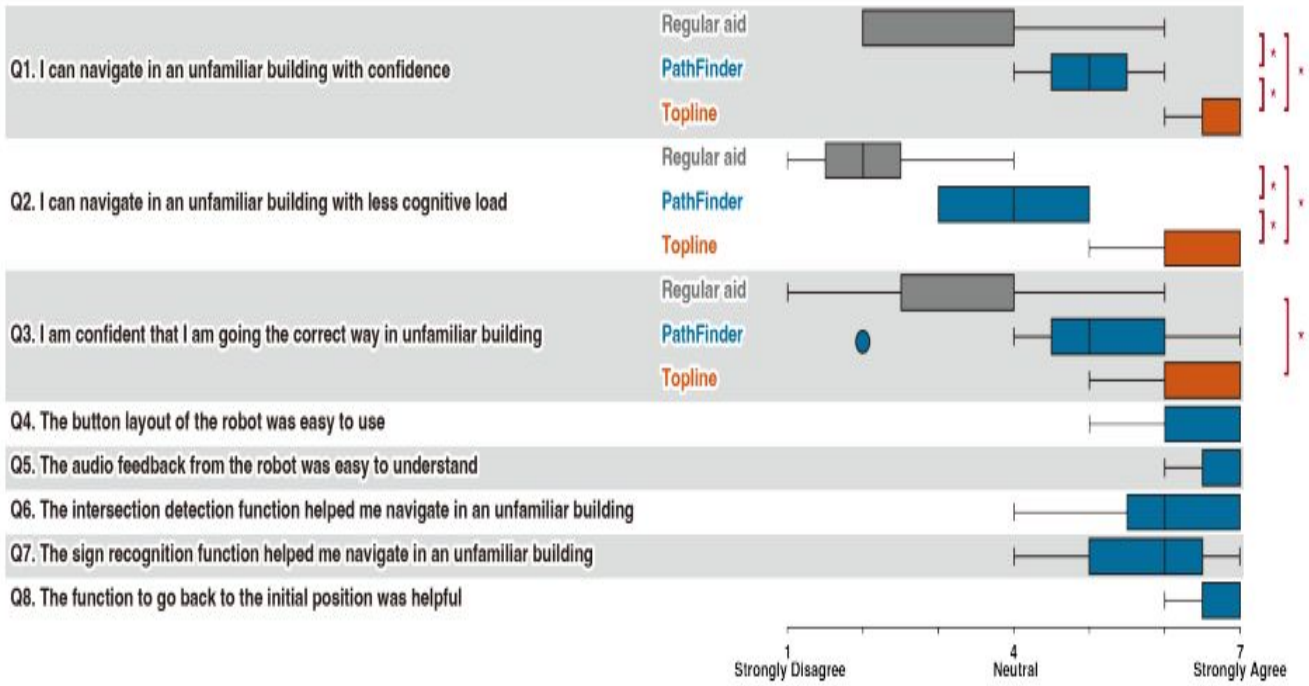
DATA COLLECTION

Feedback was gathered through interviews, Likert-scale questionnaires, and video observations. Usability was also measured using the System Usability Scale (SUS).

RESULTS

KEY FINDINGS

- PathFinder effectively increased user confidence and provided better navigation assistance compared to regular aids.



KEY FINDINGS

Table 3: Demographic information of blind participants in our main study (P06–P12). Also listed are the main study participants' normalized task completion times, and the number of times they asked for the route during navigation. *1: normalized as they chose a slower speed. *2: normalized as the previous user's topline setting was used accidentally

ID	Age	Age of onset	Gender	Navigation Aid	SUS	Normalized task completion time [sec]				Times asked for route	
						Route 1		Route 2		Route 1	Route 2
						PathFinder	Topline	PathFinder	Topline	PathFinder	
P06	68	0	Male	Cane	87.5	398.3	59.2	491.5	240.7	4	6
P07	69	49	Female	Cane	95.0	174.5 *1	66.3 *1	919.8 *1	234.7 *1	0	3
P08	63	0	Female	Cane	72.5	854.3 *1	66.1 *1	914.9 *1	239.0 *1	2	6
P09	63	56	Male	Cane	80.0	260.4	66.7 *2	601.5	230.8	0	3
P10	74	0	Female	Cane	92.5	223.6	60.1	404.2	259.9	0	2
P11	63	3	Female	Cane	90.0	147.3	60.9	350.3	240.6	0	3
P12	50	1	Male	Guide dog	52.5	163.1	63.0	573.0	232.1	3	2
Mean	64.29				85.25	317.36	63.16	607.88	239.69	1.29	3.43
±SD	±7.52				±15.74	±251.68	±3.20	±228.85	±9.78	±1.70	±1.80

KEY FINDINGS

- The system's intersection detection was accurate in most cases, but some errors occurred in crowded environments.

  Even though the participants found their destination slower than when they had an aid or topline, it still gave them a sense of independence(as can be seen in the interview) and the study overall proved the concept of PathFinder.

In the video analysis researchers found that participants were confused when using the sign recognition. The system would read signs too early and make i.e. before the intersection sending participants down the wrong path

DISCUSSION

IMPLICATIONS

- PathFinder offers a middle-ground solution between high-cost, map-based systems and traditional navigation aids, potentially expanding the usability of indoor navigation technologies for blind users.

LIMITATIONS

- The study was conducted on only two routes.
- The sign and intersection detection was used in only one building, this means that it could potentially vary in other environments.
- Features such as elevators or stairs may have been rated higher in the participatory study if it was conducted in an environment with those features.
- The participant demographic was not diverse or large.

CONCLUSION

CONCLUSION

PathFinder represents a promising step towards more accessible indoor navigation for blind individuals, reducing the need for prebuilt maps. The study highlights the need for further improvements in interface design and recognition capabilities, but overall, the research demonstrates significant potential for enhancing independent navigation in unfamiliar buildings.

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Dungeons & Deepfakes: Using scenario-based role-play to study journalists' behavior towards using AI-based verification tools for video content

Authors :Saniat Javid Sohrawardi, Andrea Hickerson, Y. Kelly Wu and Matthew Wright

Background

- Authors :Saniat Javid Sohrawardi, Andrea Hickerson, Y. Kelly Wu and Matthew Wright
- Everyone but Andrea Hickerson studied at Rochester Institute of Technology
- Andrea Hickerson studied at University of Mississippi
- Each of these authors besides Y. Kelly Wu have released multiple papers on HCI
- Published by : ACM
- Released May 2024

Abstract

- With the developing threat of deepfakes, information verification has become a serious challenge for journalists
- Although they're tools that have been developed to detect deepfakes, these sometimes give inaccurate results.
- Using a role-play methodology that was inspired by the popular tabletop game dungeons and dragons, this study goes over the possible impacts of unreliable deepfake detection tools
- The researchers examined how journalists verify video content under different conditions and decisions on when and what to publish.
- The research finds that journalists are great at verifying information but rely on it too heavily
- The paper suggests that we should argue for a more cautious release of these tools and proper training for them.

Methodology

- The methodology of this paper is a unique one, it's a scenario-based role-playing methodology that was inspired by the tabletop game Dungeons and Dragons, with each session being about an hour long.
- This roleplaying study would simulate real world scenarios that can happen in journalism
- Before the sessions would begin, participants would be briefed about deepfakes and deepfake detection tools.
- Journalists were presented videos which could potentially have been manipulated or have deepfake elements within them and they were expected to use a mix of traditional verification techniques and AI based tools that were designed to detect the use of deepfakes.

Methodology

- Data collections took the form of :
- Zoom recordings from online sessions
- In person group meeting audio recordings
- Handwritten notes from both
- Participants were encouraged to think aloud to allow the people conducting the study insights into their decision-making process
- The main objective was to understand how participants approached verifying video-based information and their interaction with deepfake detection tools

Methodology

- The study allowed researchers to observe behaviors in real-time in a controlled but natural setting
- Since the study was conducted online and in person, it was flexible
- With the use of the role-playing format, they were properly able to capture how participants interacted with the tools

Results

- The key findings found that while journalists appreciated the AI tools, they preferred using their traditional methods
- The deepfake tools were used when traditional methods proved inefficient or when there was limited time.
- Another result that was found was that some participants overused AI tools, especially when the AI confirmed their initial impressions.
- Although it was nice to see the high acceptance rate of this technology among participants, developers must be aware of the high dependency of users for this type of technology

Discussions

- Since the study was conducted in a role-playing based method, researchers were able to have users interact with the technology and see how they react and use it.
- The results indicate that there needs to be better training and awareness of these tools so that there isn't an overreliance, even though these tools can be useful.
- The study also discusses how journalists need to understand the strengths and limitations of these tools. Human error is inevitable so it's important to mitigate potential mistakes that can be made using automated technology.

Discussions

- The limitations of this study were that participants that were recruited were based only in the US so the findings do not reflect the opinions of many other journalists.
- Though the participants came from different media organizations so there were varying thought processes and practices.

Conclusion

- The paper concludes that AI-Based deepfake detection has a promising future when it comes to helping journalists verify media, though the overreliance of these tools must be mitigated through better training.
- The research also shows that traditional methods will always be heavily relied on and AI would serve as a complementary resource for journalists to use instead of a replacement.

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(Re)discovering the Physical Body Online:

Strategies and Challenges to Approach Non-Cisgender Identity in Social Virtual Reality

COMP 3603 - 2024/16/24/ - Assignment 1

Literature Review and Presentation on Human-Computer Interaction (HCI) Papers

Publication Information

- **Conference:** Presented at the 2022 CHI Conference on Human Factors in Computing Systems (CHI ’23), April 29th – May 5th, 2022, New Orleans, Louisiana USA.
- **Publisher:** Association for Computing Machinery (ACM).
- **Context:** CHI is a leading conference in HCI, providing a reputable platform for sharing groundbreaking research in this domain.

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- Ph.D. HCC candidate
- Graduate teaching assistant at Clemson University
- Associate Fellow of the National Global Entrepreneurship Monitor (GEM) Consortium
- 8 HCI research publications, with multiple related to virtual reality.

Abstract

This study examines the complex experiences of non-cisgender users (e.g., transgender, non-binary, and genderfluid) within social VR. It highlights the evolution of gender understanding beyond the binary, and how users build and present their identities online. It also argues for a reassessment of how social VR technologies support diverse gender identities and aims to guide the design of a more inclusive metaverse.

Methodology

This research centres around two primary questions:

1. *"What strategies do non-cisgender users use to build and experience their diverse gender identities in social VR?"*

2. *What challenges do non-cisgender users often face in their identity practices in social VR?"*

To answer them, the authors employed an interview study, allowing for deep, qualitative insights from a small number of participants.

Methodology -> Recruitment

Notices requesting non-cisgender participants who had previously used a social VR platform within the past year were posted on popular online forums and Discord servers for social VR and queer gamers/users, as well as popular social VR blogs. Additionally, two authors reached out to attendees at queer events held in AltspaceVR and VRChat.

Methodology -> Participants

The broader study involved 59 participants, though this sub-study focused on 15 non-cisgender individuals (7 trans women, 4 genderfluid persons, 3 non-binary persons, 1 trans man). Interviews were conducted between October 2019 and February 2021 via text or voice chat on Discord, Zoom calls, or directly within social VR environments, depending on participant preferences, lasting 78 minutes on average.

Table 1: Demographic Information of Interviewees

Note: N/A - participant preferred not to answer; NH/PI refers to Native Hawaiian and other Pacific Islanders

ID	Gender	Sexual Orientation	Ethnicity	Age	Social VR platforms used	Experience (months)
P1	Genderfluid	Queer	White	21	Rec Room; VRChat; AltspaceVR	8
P2	Non-binary	N/A	White	20	VRChat; Rec Room	24
P3	Trans Woman	Lesbian	White	23	VRChat	13
P4	Genderfluid	Pansexual	White	21	VRChat	36
P5	Trans Woman	Bisexual	NH/PI	15	VRChat	1
P6	Non-binary	Pansexual	White	20	VRChat	30
P7	Trans Man	Straight	White	19	VRChat; Roblox	48
P8	Non-binary	N/A	Black	28	AltspaceVR	10
P9	Genderfluid	Asexual	White	24	AltspaceVR; VRChat	30
P10	Genderfluid	Bi-curious	Mixed	25	VRChat; ChilloutVR	7
P11	Trans Woman	Queer	White	15	VRChat; Rec Room; AltspaceVR	4
P12	Trans Woman	N/A	White	30	AltspaceVR; VRChat	6
P13	Trans Woman	N/A	White	32	VRChat; Rec Room	6
P14	Trans Woman	N/A	White	26	VRChat	18
P15	Trans Woman	N/A	White	21	VRChat; High Fidelity; AltspaceVR; Rec Room; BigScreen	24

Methodology -> Interviews

Participants received an informed consent document before the interview. For safety and privacy, no identifiable information was collected. Social VR-based interviews were conducted in private instances, with participants under 18 interviewed solely via text chat. During the interviews, basic demographic and commonly used social VR applications/devices data were collected, following questions about participant experiences and strategies for expressing their gender identity in social VR.

Methodology -> Data Analysis

A grounded theory approach was used to qualitatively analyze the data. By identifying recurring themes and concepts from the interviews that addressed the research questions, key strategies and challenges related to non-cisgender identities in social VR were revealed.

Results

The study found that non-cisgender users often leverage avatars and vocal training to explore and present their gender identities, with full-body tracking adding to the immersion. These methods help align their online presence with their gender. Supportive communities and non-cisgender-focused virtual events offer valuable moments for validation and social connection. However, significant issues such as transphobic harassment and misgendering remain prevalent, particularly in public VR spaces. This is compounded by societal pressure to conform to traditional gender roles, and the public nature of many VR environments.

Limitations

This study has multiple limitations. The sample size for the sub-study is relatively small compared to the broader study and predominantly composed white participants, limiting ethnic diversity. Additionally, the research team was entirely cisgender, potentially affecting their perspective on non-cisgender experiences. Future research should aim for a larger and more diverse sample and include researchers from a wider range of gender identities.

Conclusion

As social VR grows in popularity, it serves a greater importance in the identity practices of marginalized groups like non-cisgender users. It allows for the re-invention and exploration of one's gender identity through full body tracked avatars, immersive 3D content, and communal support. This paper also notes the prevalence of harassment and misgendering within the virtual space, and advocates for a safer and more inclusive environment.

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