Preliminary Exploration on Intelligent Social Cues in Wearable Augmented Reality to Support Passing Encounters for People with Low Vision

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ABSTRACT

In-passing encounters—such as recognizing a familiar face in a hallway or noticing someone waving—are socially significant moments that depend on quickly reading non-verbal cues. For people with low vision (LV), these cues are especially hard to catch while on the move, yet prior assistive technology has largely focused on audio-based feedback or stationary 1-on-1 conversation settings. We present PassCue, a wearable AR system that visually augments social cues critical to in-passing encounters, including spatial awareness of people, identity recognition, facial expressions, eye contact, and gestures. For each cue, PassCue offers *visibility-based* augmentations that enhance body and face features to help users interpret non-verbal social cues for themselves, and *interpretation-based* augmentations that offload this interpretation to the system, conveying meaning directly through symbolic representations. Through a preliminary co-design study with six LV participants, this position paper explores key challenges and opportunities for AR on-the-go: supporting adaptive, context-aware augmentation as social situations shift and balancing social awareness with cognitive load during locomotion. We also include discussion about such research evaluating, incorporating, and designing for the distinct needs of the DeafBlind community, a significant portion of which still rely heavily on their remaining vision.

CCS CONCEPTS

• **Human-centered computing → Mixed / augmented reality**; **Accessibility systems and tools**; • **Computing methodologies → Computer vision**.

KEYWORDS

augmented reality, accessibility, low vision, social interaction, in-passing, visual augmentation

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1 INTRODUCTION

Social engagement is fundamental to human wellbeing, underpinning our need for meaningful relationships and belonging [7], and is central to professional success as well [32]. Much communication happens without words—through physical cues such as proximity, movements, facial expressions, and gestures—which together constitute the majority of interpersonal communication [4, 20, 31]. For people with low vision (LV), accessing these non-verbal cues presents a significant challenge [18, 10]: reduced visual acuity and contrast sensitivity can make faces blurry and washed out, hindering recognition and expression-reading [19]. When such cues are unavailable, interactions can become strained or break down entirely [32], and a lack of patience from sighted people can compound over time into broader social exclusion [37, 35]

Prior assistive technology for non-verbal cue perception has focused on audio-based feedback for blind users [28, 43, 8, 12, 36, 21, 5]. Unlike those who are completely blind, people with LV rely on residual vision and tools that enhance visual information [33, 34]. Augmented Reality (AR) has shown promise for enhancing LV users' visual perception in daily tasks [25, 38, 42, 40, 41, 27, 24], yet little research has investigated AR for enhancing non-verbal social cues specifically. Existing work on visual augmentations for social cues has been largely limited to 1-on-1 conversations [28, 23, 44]. Yet many socially significant moments happen outside of conversation—in brief, fleeting exchanges while people are on the move. We focus specifically on these in-passing encounters, such as walking by a familiar face on the street or moving through a party. These moments are often where people decide whether to initiate a conversation, a decision requiring rapid reading of cues like eye contact, waving, or openness [6]. For people with LV, these cues are especially hard to catch: the interaction window is short, people may be at a distance, and multiple people may be moving simultaneously. Missing them can mean missing a social opportunity entirely—or

(a) (b) (c) (d)

Figure 1: Examples of some of the visual augmentations in PassCue for the five social cues, showing both enhancement-based (allowing user interpretation) and interpretation-based (directly conveying meaning) approaches. See Figure 2 in the Appendix for all designs. (a) Spatial awareness: contours around each person (*enhancement*) and count icons show the number and location of people (*interpretation*). (b) Recognition and Facial Expressions (*enhancement*): face magnification. (c) Gaze (*enhancement*): arrows show gaze direction. (d)Gestures (*interpretation*): icons indicate gesture type (e.g., waving).

worse, failing to acknowledge someone who greeted you—leading to the social awkwardness that compounds into broader isolation [32]. These challenges are distinct from 1-on-1 conversations and raise new design questions for AR systems working on-the-go in dynamic environments.

Recent advances in computer vision and on-device AI make real-time social augmentation increasingly feasible. Lightweight models for face detection, recognition, gesture detection, and pose estimation can run in real time on edge hardware [14, 39, 17, 9]; commercial facial expression recognition already operates in real-world conditions[1,2]; and appearance-based gaze estimation [11, 29] is approaching reliable on-device deployment. Together, these open the door to context-aware AR systems that surface the social signals that matter most in a given moment. To explore this for LV users in in-passing encounters, we built PassCue, a wearable AR system that detects and visually augments cues commonly found challenging while on the move—familiar face recognition, mutual eye contact, and waving. We conducted a study with six LV participants to understand which augmentations are most useful in these time-constrained, dynamic interactions and how they should be designed. We present PassCue's design, our preliminary findings, and implications for wearable AR in everyday social encounters.

2 PASSCUE

To explore what social cues to augment and how in in-passing scenarios, we built PassCue, a prototype AR system with augmentation probes designed to ground co-design discussions with LV participants (Figure 1). Based on prior work [6, 18, 13, 1, 22], our system targets five social cues challenging for LV users in passing encounters: (1) spatial awareness of people, (2) identity recognition, (3) facial expressions, (4) eye contact and attention, and (5) body/head gestures. For each cue, we designed two augmentation approaches: *visibility-based* augmentations that increase the salience of cues (e.g., contours, magnification) while preserving the user's ability to interpret them, and *interpretation-based* augmentations that convey cue meaning directly through symbolic representations (e.g., emojis, icons, name labels). Figure 2 in Appendix demonstrates both approaches for all five cues.

Spatial Awareness of People. Low contrast environments and reduced visual acuity can make people appear as indistinct blobs at a distance [6]. Our *visibility-based* design enhances each person's contrast using contours [26], while our *interpretation-based* design shows a count icon indicating the number of people per group.

Recognizing People. LV people often cannot see enough facial detail to identify someone. Inspired by magnifiers—a common LV assistive tool [3, 2]—our *visibility-based* design magnifies each person's face, while our *interpretation-based* design displays name label icons [28].

Understanding Facial Expressions. Similar challenges apply to reading facial expressions at a distance. We reuse face magnification as our *visibility-based* design, and use emoji icons to convey detected emotions as our *interpretation-based* design [23].

Mutual Eye Contact and Attention. Detecting whether someone is making eye contact—a key signal of intent to interact—or tracking where their attention is directed can be difficult for LV users in passing [18, 6]. Our *visibility-based* design shows a gaze direction arrow, while our *interpretation-based* design shows an icon only when mutual eye contact with the wearer is detected.

Body and Head Gestures. Waves and head nods are common acknowledgment gestures that may be hard to see at a distance [18, 6]. Our *visibility-based* design highlights the gesturing limb with contours [26], while our *interpretation-based* design shows an icon indicating the gesture type.

3 PRELIMINARY EVALUATION AND FINDINGS

To understand what visual augmentations are useful during in-passing encounters for people with LV and how they should be designed, we are running an in-lab user study with PassCue. We collected data from six LV participants that we recruited through local disability networks and online communities. Each session lasted 180 minutes and followed four phases: demographics, a semi-structured interview about what social cues the participant found

[1]https://www.affectiva.com/
[2]https://www.morphcast.com/

challenging but interesting in-passing, and a co-design session using the 10 design probes described in Section 2, and a post-task interview.

4 PRELIMINARY FINDINGS

Our preliminary findings suggests that visual augmentations for all five types of social cues can be useful for LV people during in-passing scenarios, particularly because the visual augmentations could help them locate where the social cues were happening and from which person in their remaining vision (unlike audio or tactile cues).

Visibility vs. interpretation trade-offs. We observed a strong preference for visibility-based augmentations (contours, magnification) over interpretation-based ones (icons, emojis) for most cues. Participants valued retaining agency to interpret cues themselves when possible. However, preferences shifted toward interpretation when: (1) visual acuity was too low to discern enhanced details, (2) the environment had insufficient contrast, or (3) cognitive load needed to be reduced (e.g. too many people in the environment) One participant articulated this as wanting "the ability to figure it out for myself" (P4) when their condition allowed.

Progressive and adaptive augmentation. Multiple participants wanted augmentations that intelligently transition between modes. For example, mutual eye contact icons could trigger face magnification for identity recognition, which could then incorporate facial expression information —mirroring natural social progression from noticing someone to engaging with them.

Multimodal preferences. Four of six participants expressed interest in supplementing visual augmentations with audio feedback, particularly for spatial information (e.g., "someone is making eye contact on your right") or discrete events (e.g., counting people waving). However, all preferred visual-first approaches, using audio as supplementary rather than primary.

5 CHALLENGES AND FUTURE WORK

Our preliminary findings with PassCue reveal both challenges and opportunities for AR systems supporting social interaction on-the-move, particularly for users with low vision navigating dynamic social contexts.

Adaptive Augmentation for Shifting Social Contexts. A core challenge and opportunity emerged from our study: participants wanted augmentations that adapt intelligently to shifting social contexts while on the move, building on each other sequentially. For example, if the person is someone that you know AND you both make mutual eye contact, then an indicator for eye contact and their name could appear, followed by face magnification–which then incorporates facial expression information–mirroring natural social progression. Such a system must also recognize transitions between fundamentally different social contexts: in-passing encounters where spatial awareness, recognizing people, and seeing acknowledgment is important, 1-on-1 conversations where facial expressions and sustained eye contact become more of the focus, and group settings where tracking multiple people's attention might be more of the priority [16, 15]. Our findings suggest that relevant cues, preferred augmentation styles, and acceptable levels of detail all shift across these contexts. The core design challenge is therefore how AR systems can infer social context and user intent rapidly enough to reconfigure augmentations fluidly–without overwhelming users with constant mode-switching or requiring explicit manual control while on-the-move. A natural next step for this work is therefore to investigate how to combine all five augmentations into a single, unified system that can dynamically surface and suppress cues in context—without conflicts or cognitive overload—and to evaluate this in a fuller real-world study.

Beyond Audio: Visual Access for DeafBlind Communities. Beyond the general LV population, our work has particular implications for the DeafBlind community, a substantial portion of whom are both d/Deaf or hard of hearing (DHH) and low vision, with many—especially those with Usher syndrome—experiencing progressive vision loss. [30]. Current assistive technologies for social cue perception for blind and low vision users rely heavily on audio feedback, which is inaccessible to DeafBlind individuals, making visual augmentations especially critical for this group. Yet no prior work has explored what social cues are most important and challenging for LV DeafBlind people in social interactions, or how their needs might differ from those of LV hearing users. For DeafBlind people who use visual sign language, for instance, augmentations like gesture contours and hand segmentation would likely take on greater importance, as hands, fingers, arms, and facial expressions carry grammatical and emotional meaning in sign language. This suggests that in-passing scenarios may look quite different for LV DeafBlind users: someone might try to get their attention from a distance by waving or signing—both far more common in Deaf spaces—or there may be other signing conversations happening nearby that they want to follow. As a result, LV DeafBlind people likely have distinct preferences for which social cues need to be enhanced and when, pointing to an important direction for future AR on-the-go work.

Balancing Awareness and Cognitive Load While Moving. Finally, our findings highlight a fundamental challenge for AR on-the-move: providing rich social awareness without overwhelming users who must simultaneously navigate physical spaces. Participants usually liked augmentations that helped them locate where social cues were happening and from whom, suggesting that spatial grounding is critical. However, they also requested mechanisms to reduce visual clutter (e.g., showing face magnification only for the person being looked at in groups of 4+, or limiting emoji duration to 5 seconds This points to an opportunity for attention-aware AR systems that leverage gaze, head orientation, and movement patterns to selectively surface relevant augmentations while suppressing peripheral information–particularly important when users are in locomotion and their attentional resources are divided between social and navigational demands.

REFERENCES

[1] Tousif Ahmed, Patrick Shaffer, Kay Connelly, David Crandall, and Apu Kapadia. 2016. Addressing physical safety, security, and privacy for people with visual impairments. In *Twelfth Symposium on Usable Privacy and Security (SOUPS 2016)*, 341–354.

[2] American Foundation for the Blind. [n. d.] Cctvs/video magnifiers. https://afb.org/blindness-and-low-vision/using-technology/assistive-technology-products/video-magnifiers. Accessed: Mar. 1, 2026. ().

[3] Apple Inc. [n. d.] Magnify or describe things around you with magnifier on iPhone. https://support.apple.com/guide/iphone/magnify-or-describe-things-around-you-iphe867dc99c/ios. Accessed: Mar. 1, 2026. ().

[4] Michael Argyle. 1976. Non-verbal communication and language. *Royal Institute of Philosophy Supplements*, 10, 63–78.

[5] Douglas Astler et al. 2011. Increased accessibility to nonverbal communication through facial and expression recognition technologies for blind/visually impaired subjects. In *The proceedings of the 13th international ACM SIGACCESS conference on Computers and accessibility*, 259–260.

[6] Maryam Bandukda, Yichen Wang, Monica Perusquia-Hernandez, Franklin Mingzhe Li, and Catherine Holloway. 2024. Context matters: investigating information sharing in mixed-visual ability social interactions. In *Extended Abstracts of the CHI Conference on Human Factors in Computing Systems*, 1–8.

[7] Roy F Baumeister and Mark R Leary. 2017. The need to belong: desire for interpersonal attachments as a fundamental human motivation. *Interpersonal development*, 57–89.

[8] Cynthia L Bennett, Cole Gleason, Morgan Klaus Scheuerman, Jeffrey P Bigham, Anhong Guo, and Alexandra To. 2021. "it's complicated": negotiating accessibility and (mis) representation in image descriptions of race, gender, and disability. In *Proceedings of the 2021 chi conference on human factors in computing systems*, 1–19.

[9] Fadi Boutros, Marco Huber, Patrick Siebke, Tim Rieber, and Naser Damer. 2022. Sface: privacy-friendly and accurate face recognition using synthetic data. In *2022 IEEE International Joint Conference on Biometrics (IJCB)*. IEEE, 1–11.

[10] Giulia Cappagli, Sara Finocchietti, Gabriel Baud-Bovy, Leonardo Badino, Alessandro D'Ausilio, Elena Cocchi, and Monica Gori. 2018. Assessing social competence in visually impaired people and proposing an interventional program in visually impaired children. *IEEE Transactions on Cognitive and Developmental Systems*, 10, 4, 929–935.

[11] Yihua Cheng, Haofei Wang, Yiwei Bao, and Feng Lu. 2024. Appearance-based gaze estimation with deep learning: a review and benchmark. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 46, 12, 7509–7528.

[12] Laurindo de Sousa Britto Neto, Vanessa Regina Margareth Lima Maike, Fernando Luiz Koch, Maria Cecília Calani Baranauskas, Anderson de Rezende Rocha, and Siome Klein Goldenstein. 2015. A wearable face recognition system built into a smartwatch and the blind and low vision users. In *International Conference on Enterprise Information Systems*. Springer, 515–528.

[13] Bhanuka Gamage, Thanh-Toan Do, Nicholas Seow Chiang Price, Arthur Lowery, and Kim Marriott. 2023. What do blind and low-vision people really want from assistive smart devices? comparison of the literature with a focus study. In *Proceedings of the 25th international ACM SIGACCESS conference on computers and accessibility*, 1–21.

[14] Google. 2025. MediaPipe solutions guide. https://ai.google.dev/edge/mediapipe/solutions/guide. Last updated Sep. 9, 2025; Accessed: Mar. 1, 2026. (Sept. 2025).

[15] Katherine Jones, Martin Grayson, Cecily Morrison, Ute Leonards, and Oussama Metatla. 2025. " put your hands up": how joint attention is initiated between blind children and their sighted peers. In *Proceedings of the 2025 CHI Conference on Human Factors in Computing Systems*, 1–18.

[16] Katherine Mary Jones, Ute Leonards, and Oussama Metatla. 2024. "i don't really get involved in that way": investigating blind and visually impaired individuals' experiences of joint attention with sighted people. In *Proceedings of the 2024 CHI Conference on Human Factors in Computing Systems*, 1–16.

[17] Rawal Khirodkar, Timur Bagautdinov, Julieta Martinez, Su Zhaoen, Austin James, Peter Selednik, Stuart Anderson, and Shunsuke Saito. 2024. Sapiens: foundation for human vision models. In *European Conference on Computer Vision*. Springer, 206–228.

[18] Susanne Klauke, Chloe Sondocie, and Ione Fine. 2023. The impact of low vision on social function: the potential importance of lost visual social cues. *Journal of Optometry*, 16, 1, 3–11.

[19] Robert C Kleiner, Cheryl Enger, Marguerite F Alexander, and Stuart L Fine. 1988. Contrast sensitivity in age-related macular degeneration. *Archives of ophthalmology*, 106, 1, 55–57.

[20] Mark L Knapp, Judith A Hall, and Terrence G Horgan. 1972. *Nonverbal communication in human interaction*. Thomson Wadsworth.

[21] Takayuki Komoda, Hisham Elser Bilal Salih, Tadashi Ebihara, Naoto Wakatsuki, and Keiichi Zempo. 2024. Auditory interface for empathetic synchronization of facial expressions between people with visual impairment and the interlocutors. In *Proceedings of the Augmented Humans International Conference 2024*, 138–147.

[22] Sreekar Krishna, Dirk Colbry, John Black, Vineeth Balasubramanian, and Sethuraman Panchanathan. 2008. A systematic requirements analysis and development of an assistive device to enhance the social interaction of people who are blind or visually impaired. In *Workshop on Computer Vision Applications for the Visually Impaired*.

[23] Florian Lang, Albrecht Schmidt, and Tonja Machulla. 2020. Augmented reality for people with low vision: symbolic and alphanumeric representation of information. In *International Conference on Computers Helping People with Special Needs*. Springer, 146–156.

[24] Jaewook Lee, Yang Li, Dylan Bunarto, Eujean Lee, Olivia H Wang, Adrian Rodriguez, Yuhang Zhao, Yapeng Tian, and Jon E Froehlich. 2024. Towards ai-powered ar for enhancing sports playability for people with low vision: an exploration of arsports. In *2024 IEEE International Symposium on Mixed and Augmented Reality Adjunct (ISMAR-Adjunct)*. IEEE, 228–233.

[25] Jaewook Lee, Andrew D Tjahjadi, Jiho Kim, Junpu Yu, Minji Park, Jiawen Zhang, Jon E Froehlich, Yapeng Tian, and Yuhang Zhao. 2024. Cookar: affordance augmentations in wearable ar to support kitchen tool interactions for people with low vision. In *Proceedings of the 37th Annual ACM Symposium on User Interface Software and Technology*, 1–16.

[26] Jaewook Lee, Andrew D. Tjahjadi, Jiho Kim, Junpu Yu, Minji Park, Jiawen Zhang, Jon E. Froehlich, Yapeng Tian, and Yuhang Zhao. 2024. Cookar: affordance augmentations in wearable ar to support kitchen tool interactions for people with low vision. In *Proceedings of the 37th Annual ACM Symposium on User Interface Software and Technology* (UIST '24) Article 141. Association for Computing Machinery, Pittsburgh, PA, USA, 16 pages. isbn: 9798400706288. doi:10.1145/3654777.3676449.

[27] Jaewook Lee, Jun Wang, Elizabeth Brown, Liam Chu, Sebastian S Rodriguez, and Jon E Froehlich. 2024. Gazepointar: a context-aware multimodal voice assistant for pronoun disambiguation in wearable augmented reality. In *Proceedings of the 2024 CHI Conference on Human Factors in Computing Systems*, 1–20.

[28] Cecily Morrison, Ed Cutrell, Martin Grayson, Geert Roumen, Rita Faia Marques, Anja Thieme, Alex Taylor, and Abigail Sellen. 2021. Peoplelens. *Interactions*, 28, 3, (Apr. 2021), 10–13. doi:10.1145/3460116.

[29] Shakhnoza Muksimova, Yakhyokhuja Valikhujaev, Sabina Umirzakova, Jushkin Baltayev, and Young Im Cho. 2025. Gazecapsnet: a lightweight gaze estimation framework. *Sensors*, 25, 4, 1224.

[30] National Center on Deafblindness. 2025. 2023 National Deafblind Child Count Report. Tech. rep. Accessed: February 12, 2026. National Center on Deafblindness, (Feb. 2025). https://www.nationaldb.org/media/doc/2023_National_Deafblind_Child_Count_Report_a.pdf.

[31] Royal Society (Great Britain). Study Group on Non-Verbal Communication et al. 1972. *Non-verbal communication*. Cambridge University Press.

[32] Sethuraman Panchanathan, Shayok Chakraborty, and Troy McDaniel. 2016. Social interaction assistant: a person-centered approach to enrich social interactions for individuals with visual impairments. *IEEE Journal of Selected Topics in Signal Processing*, 10, 5, 942–951.

[33] Sarit Szpiro, Yuhang Zhao, and Shiri Azenkot. 2016. Finding a store, searching for a product: a study of daily challenges of low vision people. In *Proceedings of the 2016 ACM International Joint Conference on Pervasive and Ubiquitous Computing*, 61–72.

[34] Sarit Felicia Anais Szpiro, Shafeka Hashash, Yuhang Zhao, and Shiri Azenkot. 2016. How people with low vision access computing devices: understanding challenges and opportunities. In *Proceedings of the 18th International ACM SIGACCESS Conference on Computers and Accessibility*, 171–180.

[35] Valerie Tadić, Linda Pring, and Naomi Dale. 2010. Are language and social communication intact in children with congenital visual impairment at school age? *Journal of Child Psychology and Psychiatry*, 51, 6, 696–705.

[36] M Iftekhar Tanveer, ASM Iftekhar Anam, Mohammed Yeasin, and Majid Khan. 2013. Do you see what i see? designing a sensory substitution device to access non-verbal modes of communication. In *Proceedings of the 15th International ACM SIGACCESS Conference on Computers and Accessibility*, 1–8.

[37] Vincent B Van Hasselt. 1983. Social adaptation in the blind. *Clinical Psychology Review*, 3, 1, 87–102.

[38] Ru Wang, Zach Potter, Yun Ho, Daniel Killough, Linxiu Zeng, Sanbrita Mondal, and Yuhang Zhao. 2024. Gazeprompt: enhancing low vision people's reading experience with gaze-aware augmentations. In *Proceedings of the 2024 CHI Conference on Human Factors in Computing Systems*, 1–17.

[39] Wei Wu, Hanyang Peng, and Shiqi Yu. 2023. Yunet: a tiny millisecond-level face detector. *Machine Intelligence Research*, 20, 5, 656–665.

[40] Yuhang Zhao, Elizabeth Kupferstein, Brenda Veronica Castro, Steven Feiner, and Shiri Azenkot. 2019. Designing ar visualizations to facilitate stair navigation for people with low vision. In *Proceedings of the 32nd annual ACM symposium on user interface software and technology*, 387–402.

[41] Yuhang Zhao, Sarit Szpiro, and Shiri Azenkot. 2015. Foresee: a customizable head-mounted vision enhancement system for people with low vision. In *Proceedings of the 17th international ACM SIGACCESS conference on computers & accessibility*, 239–249.

[42] Yuhang Zhao, Sarit Szpiro, Lei Shi, and Shiri Azenkot. 2019. Designing and evaluating a customizable head-mounted vision enhancement system for people with low vision. *ACM Transactions on Accessible Computing (TACCESS)*, 12, 4, 1–46.

[43] Yuhang Zhao, Shaomei Wu, Lindsay Reynolds, and Shiri Azenkot. 2018. A face recognition application for people with visual impairments: understanding use beyond the lab. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems* (CHI '18). Association for Computing Machinery, Montreal QC, Canada, 1–14. isbn: 9781450356206. doi:10.1145/3173574.3173789.

[44] Rafael Zuniga and John Magee. 2018. Conversation aid for people with low vision using head mounted display and computer vision emotion detection. In *International Conference on Computers Helping People with Special Needs*. Springer, 44–50.

A APPENDIX

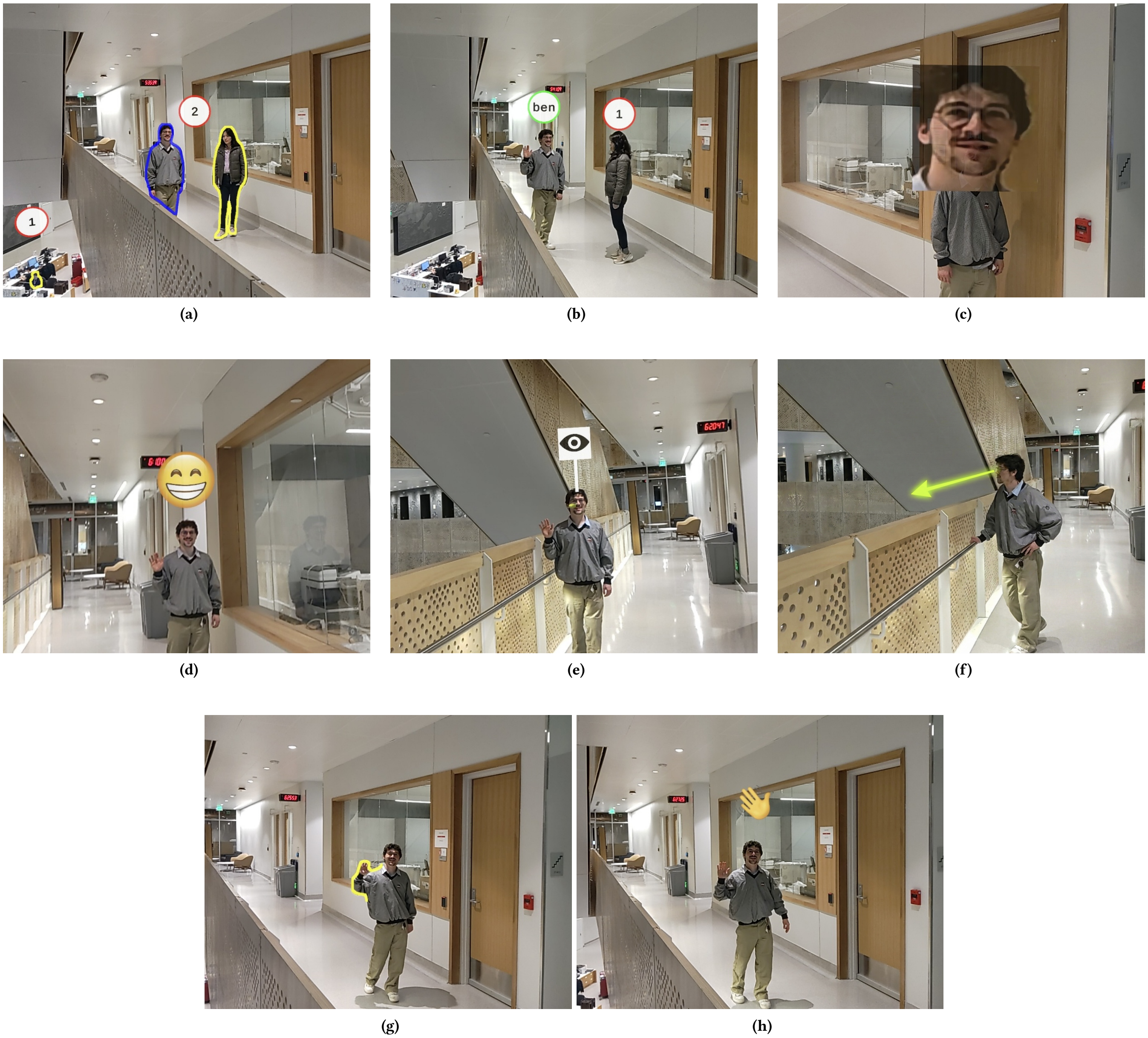

Figure 2: PassCue augmentations for five social cues, showing both enhancement-based (allowing user interpretation) and interpretation-based (directly conveying meaning) approaches. (a) Spatial awareness: contours around each person (*enhancement*) and count icons show the number and location of people (*interpretation*). (b) Recognition (*interpretation*): name icons directly label recognized individuals. (c) Recognition (*enhancement*): face magnification. (d) Facial expressions (*enhancement*): magnified faces with enhanced contrast reveal emotions. (e) Facial expressions (*interpretation*): emoji icons directly convey detected emotions. (f) Eye contact (*interpretation*): mutual eye contact icons. (g) Gaze (*enhancement*): arrows show gaze direction. (h) Gestures (*enhancement*): contours highlight arm and hand movements. (i) Gestures (*interpretation*): icons indicate gesture type (e.g., waving).

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