Human–Computer Interaction

Computer–Mediated Communication

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Today's Agenda

»   Topic overview: *CMC*

»   Discussion

Topic overview: *CMC*

What is CMC?

Definition: *Human communication via computers* and includes many different forms of synchronous, asynchronous or real-time interaction that humans have with each other using computers as tools to exchange text, images, audio, and video.[1]

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[1] Webopedia

What are CMC technologies?

» Email

» Instant messaging

» Text messaging

» Social media

» Hypertext

» Internet forums, newsgroups, bulletin boards, distribution lists

» Online learning

» Online shopping

» Phone conversations

» Videoconferencing

» Robot-mediated communication

What are some characteristics of CMC technologies?

» Temporal structure of the communication:

    » **Synchronous:** Face-to-face, videoconferencing

    » **Asynchronous:** Email, forum discussions

    » **Near-synchronous:** Instant messaging, text messaging

» Social structure of the communication:

    » **One-to-one:** Videoconferencing, email

    » **One-to-many:** Blogs, online learning

    » **Many-to-many:** Social media, chat rooms

TABLE 7.1
Technologies and Their Affordances

Affordance		Interactivity	
		Interactive	Noninteractive
Mode	Linguistic	Phone, audioconference, chat, instant messaging	E-mail, answerphone, voicemail, FAX, letter, Usenet
	Linguistic and visual	Videoconference, videophone, shared workspace	Videomail

TABLE 7.2
Effects of Different Affordances on Communication Behaviors and Processes

Affordance Type	Communication Behaviors Affected by Affordance	Core Communicative Phenomena Affected
VISUAL MODE	Facial expressions	Attention, understanding, agreement
		Conveying affect, attitude
	Head nods	Attention, understanding, agreement
		Turn taking
	Gaze	Attention
		Turn taking, reference
		Conveying affect, attitude
	Gesture	Attention
		Turn taking, reference
	Visual access to objects in a shared physical environment	Reference, attention
	Physical presence	Availability and initiation of impromptu conversation
INTERACTIVITY	Feedback via backchannels, completions, interruptions	Attention, understanding, agreement
		Turn taking, reference, repairs
		Socioemotional feedback

[2] Whittaker, 2003, Theories and methods in mediated communication

Reflection

*What is the **CMC technology** you use the most?*

Let's analyzed based on:

» **Temporal structure** (synchronous, asynchronous, near-synchronous)

» **Social structure** (one-to-one, one-to-many, many-to-many)

» **Affordances** (interactive vs. non-interactive; linguistic vs. linguistic + visual)

» **Communication behaviors** (visual cues, mechanisms for interactivity)

*Do you think the affordances **enhance** or **restrict** social presence and relational depth?*

Some Modern Examples

Platform	Temporal Structure	Social Structure	Affordances	Communication Behaviors
Email	Asynchronous	One-to-one or one-to-many	Non-interactive; primarily linguistic	Minimal visual cues (formatting, emojis); delayed turn-taking
Slack / Teams	Near-synchronous	Many-to-many (channels) or one-to-one (DMs)	Interactive; linguistic + visual (GIFs, emoji reactions, threads)	Text, emoji, reactions, presence indicators, threads for repair
Discord	Near-synchronous	Many-to-many	Highly interactive; linguistic + visual + audio	Real-time voice/video, shared screens, emojis, role markers
Zoom / Meet	Synchronous	One-to-one or many-to-many	Interactive; linguistic + visual	Gaze, facial expressions, turn-taking cues, backgrounds, reactions

Platform	Temporal Structure	Social Structure	Affordances	Communication Behaviors
TikTok / Instagram Reels	Asynchronous (viewing), synchronous (live)	One-to-many or many-to-many via comments	Partially interactive; linguistic + visual	Video cues, algorithmic comment/reply chains, live chat
Twitch	Synchronous	One-to-many	Highly interactive; linguistic + visual	Livestream video, chat overlay, emotes, parasocial feedback
Substack / Threads / X (Twitter)	Asynchronous	One-to-many or many-to-many	Semi-interactive; linguistic + visual (links, images)	Threaded posts, likes/reposts, algorithmic visibility
VRChat / Meta Horizon Workrooms	Synchronous	Many-to-many	Highly interactive; embodied + linguistic + visual	Avatar gestures, proxemics, spatial audio, shared 3D space
Spatial.io / Gather.town	Synchronous	Many-to-many	Interactive; embodied + visual + linguistic	Movement-based interactions, co-presence cues, shared objects

What are some CMC theories?

Why do we need so many theories to understand CMC?

» CMC is extremely diverse.

» Technologies are ever changing.

» Outcomes are sometimes counterintuitive.

Deficit vs. Compensation Views

Deficit **view:** The medium imposes restrictions on communication, and the resulting communication necessarily involves certain *deficits* that require communicators to manage.

Compensation **view:** People adapt to the restrictions media may impose on communication to *compensate* for the potential deficits, even often using it to their advantage.

Deficit theories

Media Richness Model (the Bandwidth Hypothesis) — Argues that communication media vary in their "richness" — their capacity to convey information cues — and that effective communication depends on matching media richness to task equivocality. The closer the mode is to FtF, the more efficient is the communication.[14]

Social Presence Theory — Introduces the concept of *social presence* — the degree to which a medium allows users to experience others as being psychologically present — as a determinant of intimacy and immediacy in mediated communication.[15]

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[14] Daft, R. L., & Lengel, R. H. (1986). *Organizational information requirements, media richness and structural design.* Management Science, 32(5), 554–571.

[15] Short, J., Williams, E., & Christie, B. (1976). *The social psychology of telecommunications.* London: John Wiley & Sons.

Compensation theories

Social Information Processing (SIP) Theory — Proposes that users adapt to cue-limited media by using available cues over time to achieve levels of relational communication comparable to face-to-face interaction.[3]

Social Identity / Deindividuation (SIDE) Theory — Argues that anonymity and reduced cues in CMC can amplify group identity rather than diminish it, leading to stronger social influence and ingroup conformity effects.[16]

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[3] Walther, J. B. (1992). *Interpersonal effects in computer-mediated interaction: A relational perspective.* Communication Research, 19(1), 52–90.

[16] Postmes, T., Spears, R., & Lea, M. (1998). Breaching or building social boundaries? SIDE-effects of computer-mediated communication. Communication Research, 25(6), 689–715.

Theory	Core Idea	Explains
Media Richness Model[14]	Communication media differ in *richness* (cue capacity, immediacy, feedback). Match medium to task complexity for effectiveness.	Task performance, efficiency
Social Presence Theory[15]	A medium's ability to convey *psychological presence* of others shapes intimacy and immediacy.	Relational warmth, perception of others
Social Information Processing (SIP)[3]	Users adapt to cue-limited media; over time, textual and timing cues can build relationships equal to face-to-face.	Relational development, adaptation
Social Identity / Deindividuation (SIDE)[16]	Anonymity in CMC can heighten *group identity* and social influence, not just reduce cues.	Group behavior, conformity, identity expression

[14] Daft, R. L., & Lengel, R. H. (1986). *Organizational information requirements, media richness and structural design.* Management Science, 32(5), 554–571.

[15] Short, J., Williams, E., & Christie, B. (1976). *The social psychology of telecommunications.* London: John Wiley & Sons.

[3] Walther, J. B. (1992). *Interpersonal effects in computer-mediated interaction: A relational perspective.* Communication Research, 19(1), 52–90.

[16] Postmes, T., Spears, R., & Lea, M. (1998). Breaching or building social boundaries? SIDE-effects of computer-mediated communication. Communication Research, 25(6), 689–715.

What are alternative, contemporary theoretical lenses?

Lens	Core Idea	How It Extends Classic CMC Theory	Example
Media Affordances[4]	Communication technologies offer *action possibilities*—visibility, persistence, editability, association—that shape social behavior.	Moves beyond media "richness" to examine *what users can do* with media, not just what the media transmit.	Slack enables visibility of conversations and persistence of knowledge; users appropriate threads for coordination.
Communicative Ecology[5]	Communication occurs across layers—technological, social, and discursive—that interact dynamically.	Frames CMC as *part of a larger ecology* of human communication practices.	Students use Discord for coordination, Zoom for meetings, and Docs for collaboration—each layer supports the whole.
Algorithmic Mediation[6]	Algorithms filter, rank, and recommend content, shaping what users see and how they interact.	Adds the role of *machine agency* to CMC theory—platforms actively shape communication flows.	Social media feeds create feedback loops of visibility and engagement, influencing identity presentation and group norms.

[4] Treem, J. W., & Leonardi, P. M. (2013). Social media use in organizations: Exploring the affordances of visibility, editability, persistence, and association. In C. T. Salmon (Ed.), Communication Yearbook 36 (pp. 143–189). Routledge.

[5] Foth, M., & Hearn, G. (2007). Networked individualism of urban residents: Discovering the communicative ecology in inner-city apartment buildings. IC&S, 10(5), 749–772.

[6] Bucher, T. (2018). If... Then: Algorithmic power and politics. Oxford University Press.

What about telepresence?

Definition: Telepresence is the perceptual illusion of non-mediation—when technology makes people feel as though they are "present" in a mediated or remote environment, or that others are "present" with them, despite physical separation.[7]

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[7] Lombard, M., & Ditton, T. (1997). At the heart of it all: The concept of presence. Journal of Computer-Mediated Communication, 3(2).

Key Characteristics

Dimension	Description	Examples
Representation	How the body or avatar conveys identity, gaze, gesture, posture	Telepresence robots (Double 3), VR avatars (Horizon Workrooms), holographic presence
Mutual awareness	Both sides can perceive and respond to each other's actions in real time	Bidirectional video, shared spatial audio
Embodied affordances	Ability to navigate, point, orient, manipulate objects	Remote robot turning toward speaker; avatar gaze cues
Social signaling	Conveying emotions or roles via embodied cues	Gestures, proxemics, facial animation
Co-presence outcomes	Trust, empathy, collaboration efficiency	Used in remote teamwork, telehealth, education

Example Research Insights

» Field of view shapes awareness — Wider camera views improved coordination and understanding; narrow views limited access to gestures and spatial cues[9]

» Device form factor affects interaction — Hands-free displays supported smoother collaboration, while handheld devices disrupted flow and increased workload[11]

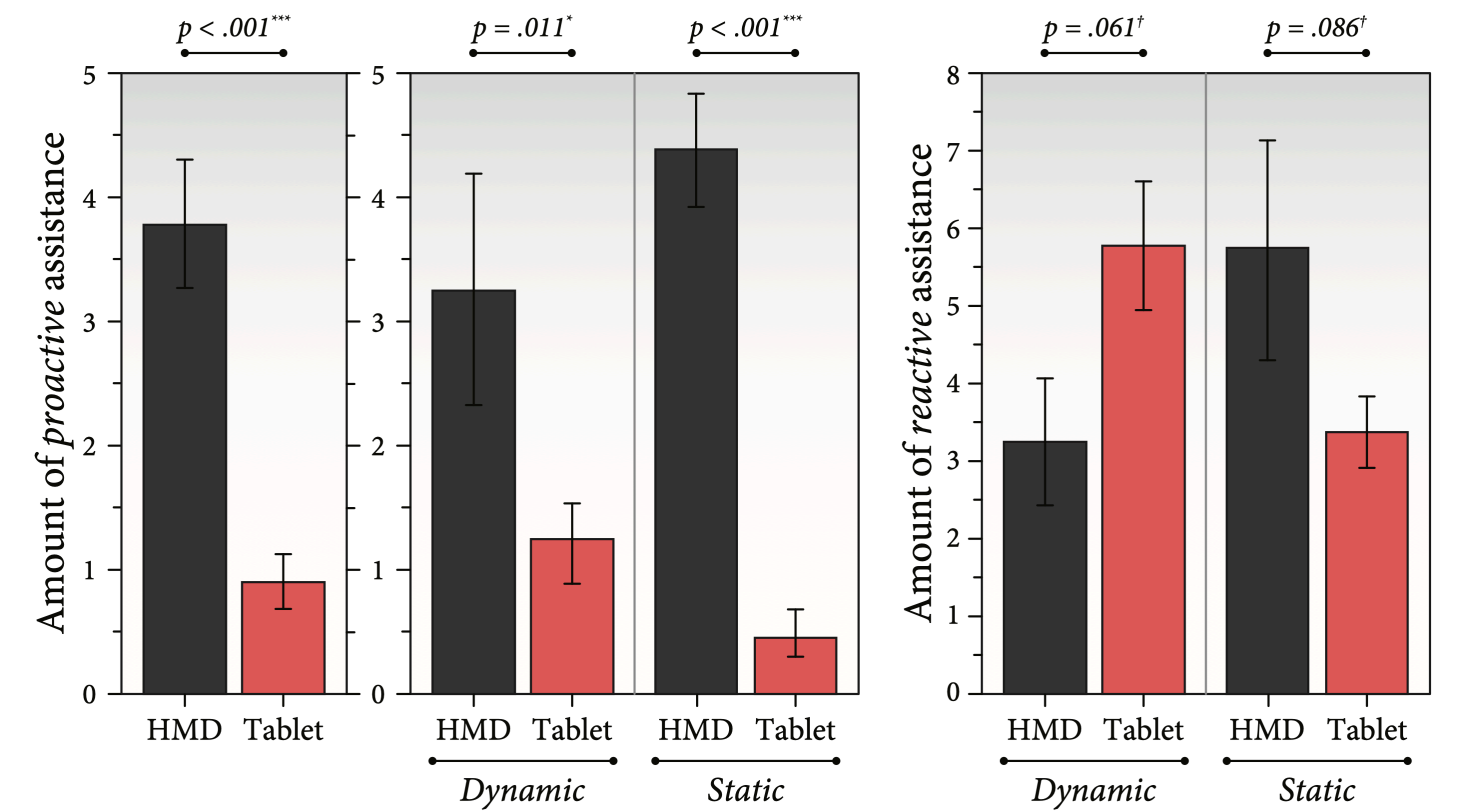» Embodiment alters social dynamics — Robot height and positioning influence perceived authority and approachability[8]
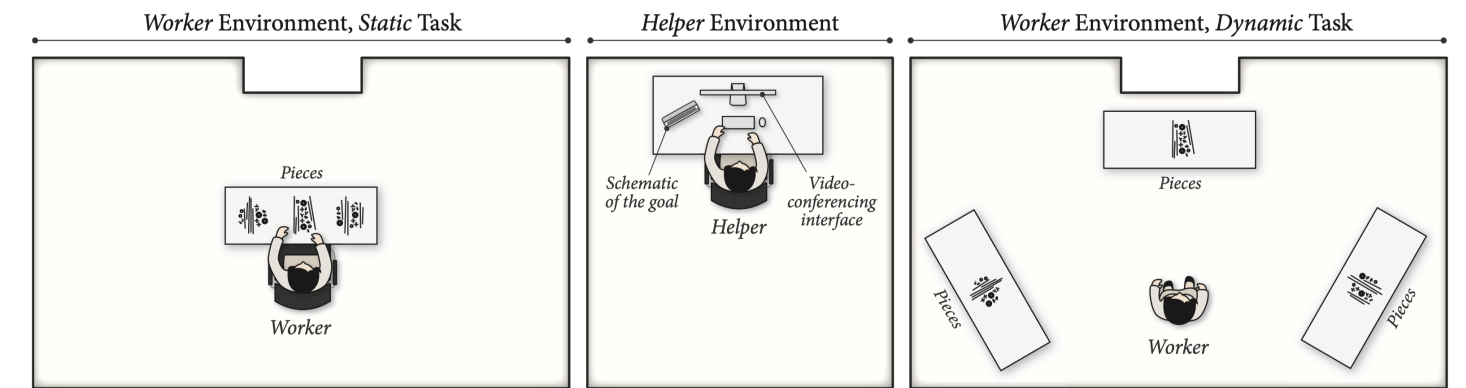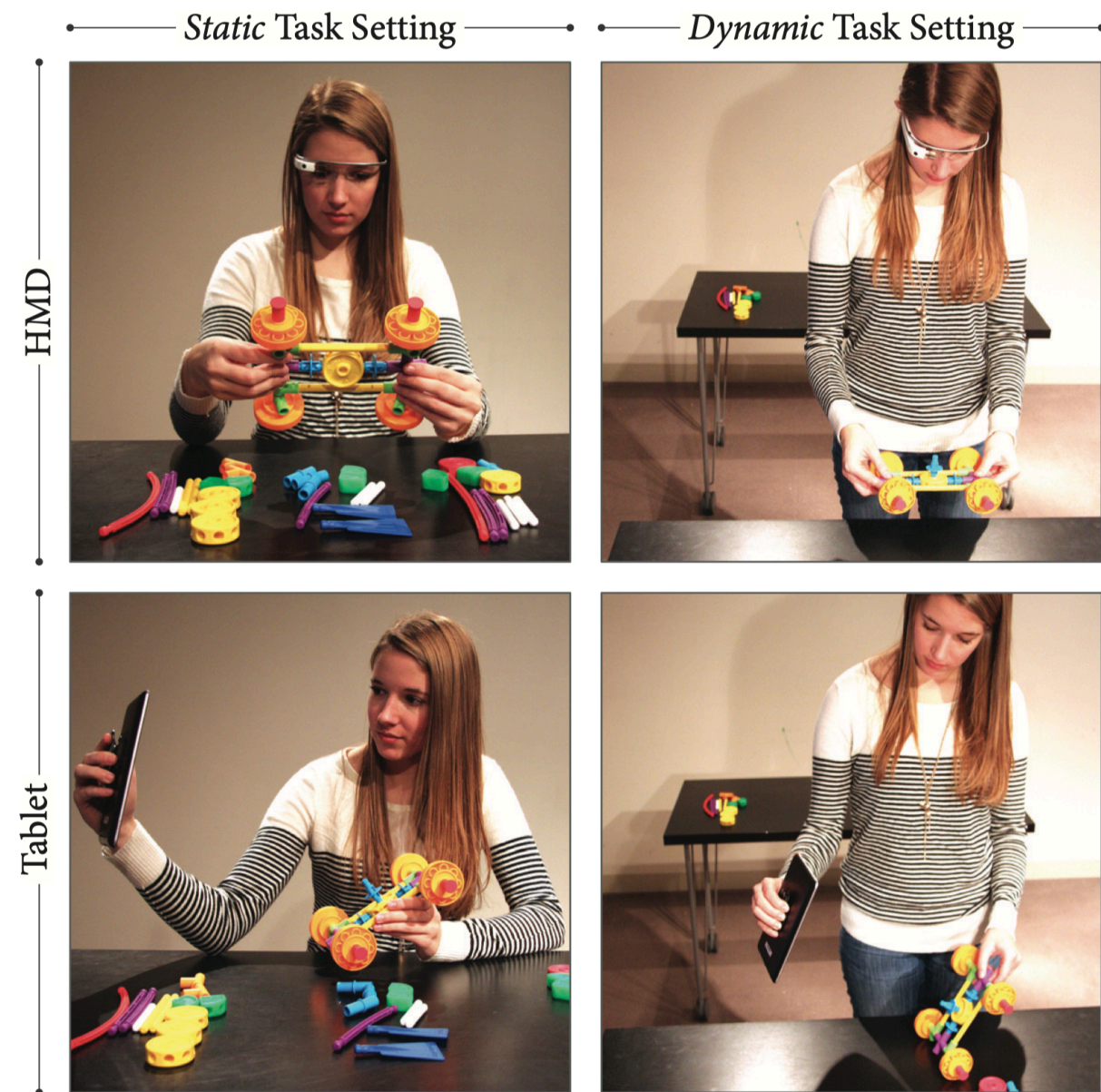
[9] Johnson, M., Rae, I., Mutlu, B., & Takayama, L. (2015). Can you see me now? How field of view affects collaboration in robotic telepresence. CHI '15, 239–248.
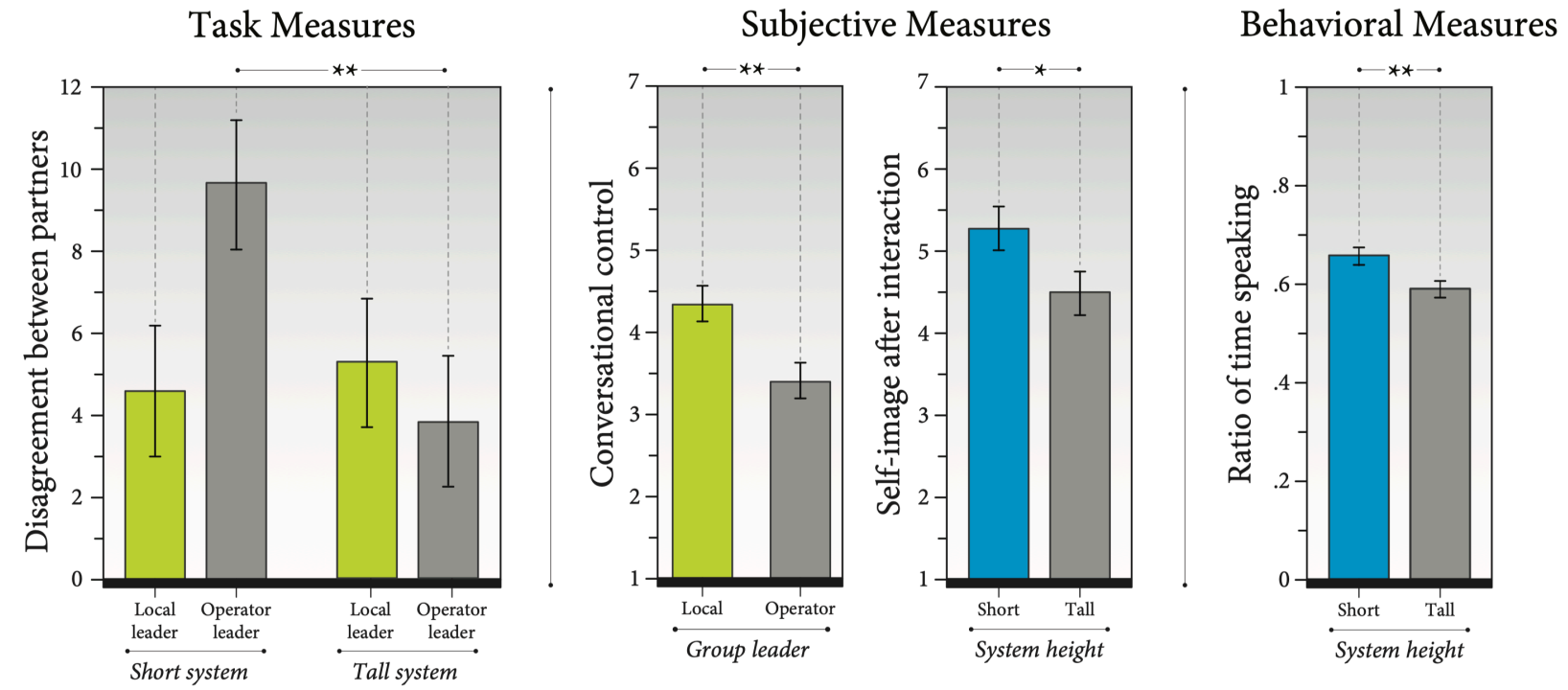
[11] Johnson, Gibson, & Mutlu (2015). Handheld or handsfree? Remote collaboration via lightweight head-mounted displays and handheld devices, CSCW 2015.
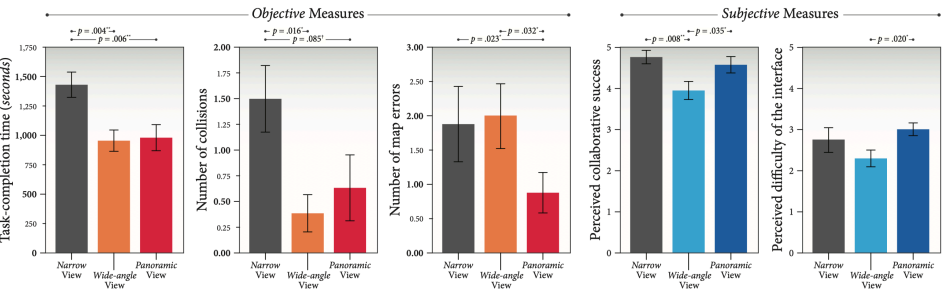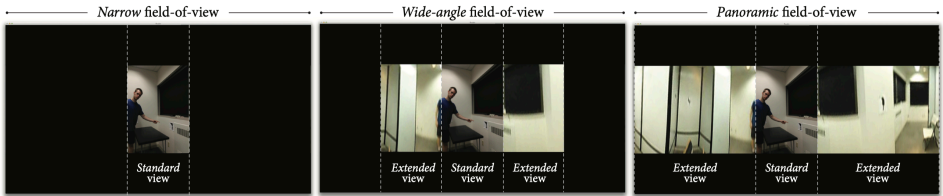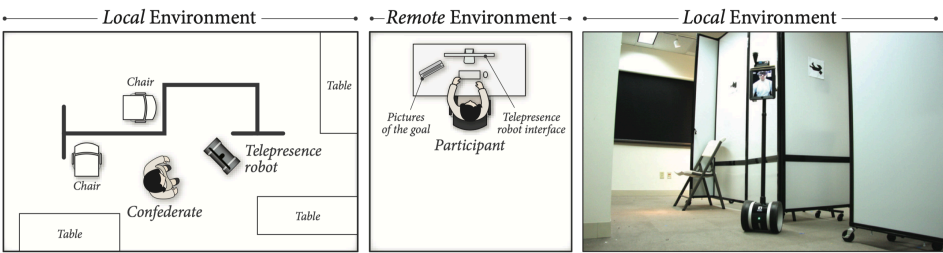
[8] Rae, I., Takayama, L., & Mutlu, B. (2013). The influence of height in robot-mediated communication. HRI '13, 1–8.

» Mobility enhances participation — Movement through space enables more natural joining, leaving, and orienting in group interaction[10]

» Telepresence is co-constructed — Both remote and local participants adapt behaviors to maintain a shared sense of presence.

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[10] Takayama, L., & Go, J. (2011). Mixing metaphors in robot communication. CHI '11, 433−442.

Task Measures

Disagreement between partners

** (Short system — Tall system)

Local leader / Operator leader — *Short system*
Local leader / Operator leader — *Tall system*

Subjective Measures

Conversational control

** Local / Operator — *Group leader*

Self-image after interaction

* Short / Tall — *System height*

Behavioral Measures

Ratio of time speaking

** Short / Tall — *System height*

Remote environment

Augmented, wide-angle view | Remote participant

Local confederate | Modified telepresence robot

Local environment

Local Environment | Remote Environment | Local Environment

Narrow field-of-view | Wide-angle field-of-view | Panoramic field-of-view

Objective Measures | Subjective Measures

Prior result	Comparison	Explanation
Keyhole effect	*Supported*	Increased collisions, slower completion times in narrow view
Cognitive tunneling	*Supported*	Errors in distance/depth judgments increased collisions in narrow view
Wide views increasing cognitive workload	*Supported*	Perceived interface difficulty increased in panoramic condition
Wide views distort velocity perception, reducing driving speed	*Unsupported, Contrasting*	Wide-angle and panoramic views support faster task completion than narrow views
Wider views associated with motion sickness	*Unsupported*	No participants commented on feeling motion sickness
Impoverished video inhibits mental map formation	*Unsupported, Contrasting*	Low-quality periphery improved mental map formation over wide-angle and narrow views

Example of telepresence in the age if AI[17]

Designing Telepresence Robots to Support Place Attachment

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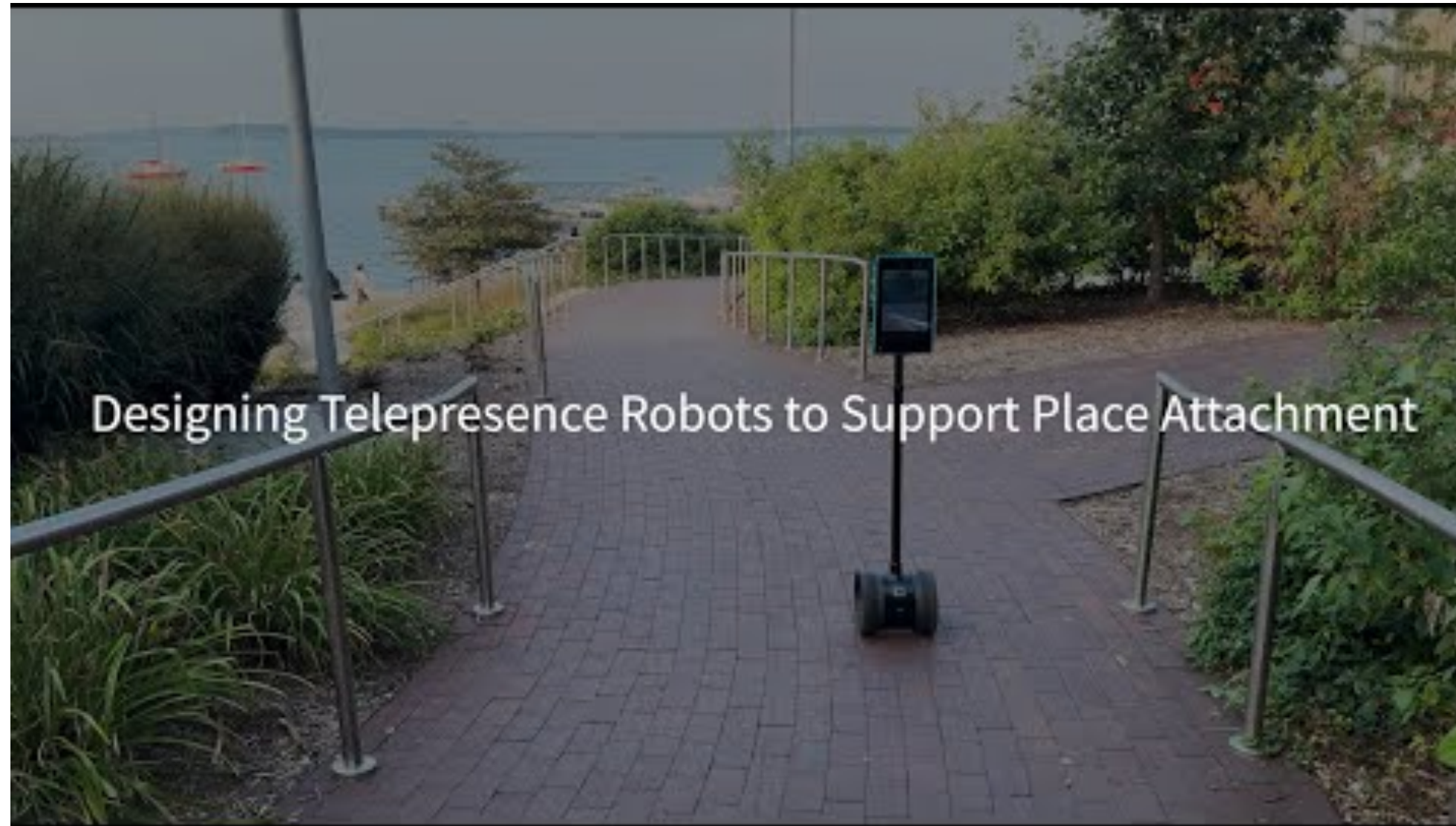
[17] Hu, Y., Zhu, A., Toma, C. L., & Mutlu, B. (2025, March). Designing telepresence robots to support place attachment. In *2025 20th ACM/IEEE International Conference on Human–Robot Interaction (HRI)* (pp. 252–261). IEEE.

Discussion Format

» We'll let AI randomly pick 3-5 names

» In the selected order, students:

    » Present their provocation/critical artifact/policy or design recommendation (30 secs)

    » Lead class discussion (5-8 min)

What's Next?

Wednesday:

» **Methods** — Read *Textbook Chapter 9*[12] + *Clifford*[^13]

» **Project** — Project next steps:

　　» Method — Due Oct 22

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[12] Lazar et al. (2017). <u>Chapter 9 — Ethnography.</u> Research methods in human–computer interaction. Morgan Kaufmann.

[^13]: Clifford, J. (1990). <u>Notes on (field) notes.Links to an external site.</u> *Fieldnotes: The makings of anthropology*, *1990*, 47–70.