Reflections on Real Presence by a Virtual Person

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Introduction

There has been a stronger emphasis in the presence research on engineering the senses than on engineering the mind. We look for ways technology can more closely approximate human sensory experience, then examine the impact of those technologies on presence. Examples of research along these lines from the Presence 2001 workshop include comparisons of sense of physical presence in mono, stereo, and 5.1 speaker audio mix (Lessiter, Freeman, Davidoff, 2001); stereoscopic versus monoscopic views (Dillon, 2001); passive haptic feedback versus no haptic feedback (Insko, Meehan, Whitton, and Brooks, 2001); impacts of immersion and pictoral realism (Hoffman, 2001); and comparisons of narrow and wide field of view (Slagen, Schuurmans, Kooijman, and Ijsselstegn, 2001). Work by Solomon and Rosenthal (2001), Harper (2001), and others extends understanding of human perception and technological capacities to create realistic sensory stimuli. Sensorial realism is certainly an important influence on presence, but there is more to the story. Presence is a subjective experience. Even perfect mediated sensory perception would not by itself automatically induce a strong sense of presence because reality does not automatically induce a strong sense of presence.

I had the opportunity to experience the U.S. Space and Rocketry Center's Space Camp in Huntsville Alabama as part of baseline research toward creating a virtual Space Camp. Space Camp is normally reserved for 5th graders, but a group of 12 adults from Michigan State University, Apple Computer, and ETI Entertainment got to pretend to be fifth graders and go through several of the mission experiences.

Approaching Space Camp by cab, what appeared to be a collection of distant church spires turned out to be Titan rockets. Walking under a Space Shuttle and through Rocket Park, the visceral impact of the size of these space objects sends bolts of realization and shock. They are enormous! You don't realize how big from watching a launch on

television. I was able to climb around in the Enterprise space shuttle capsule, peek inside myriad storage drawers, wonder at the thousand buttons along the walls and ceiling in the cockpit. But even though I was physically on a real shuttle, with my usual autostereoscopic full field of view, complete passive haptic feedback, realistic textures, and natural navigation (walking, climbing, sitting, bending, touching), I did not particularly feel like I was there.

Research by Meehan, Whitton, and Brooks (2001) and by Dillon (2001) studied heart rate and skin conductance as a way to objectively assess how well virtual experiences recreate real world experiences. To apply these measures Brooks suggests one must first establish a baseline heart rate and skin conductance of a parallel real world experience. Then measure rates in the virtual experience. If the presence is strong, heart rate and skin conductance should approximate the physical experience. Comparing my heart rate and skin conductance on the Enterprise to that of astronauts on a mission, objective measures would confirm that indeed I was not very present. I was physically inside of a space shuttle, but I did not feel what I imagine it would be like to experience being on space shuttle.

I knew both too much and too little to feel strongly present. I knew enough about space travel to believe there must be a lot more to the experience than I was getting. Although real, my shuttle was inside a large building, not on a launch pad or up in space. I wasn't weightless or worried about blowing up or feeling extreme acceleration. I couldn't look out the window and be awed by the oneness of earth or the vast emptiness of space. I also knew too little to feel as much presence as someone in the Space Program might have felt walking around this shuttle. Such a person would know what the buttons do, how items stored in the drawers are used, and how the drama of space travel happens in a shuttle. The artifact of the shuttle might have triggered their mental model of the full ("in situ"?) shuttle experience, which I could only wonder about. Lack of familiarity, limited prior experience, and limited cognitive schemas inhibited my sense of presence.

We donned flight suits and met for our first mission briefing. Space Camp runs time synchronized group role-play simulations in which each group member is assigned a NASA role and title. For mission one, there were three locations: Mission Control, the

cockpit, and passengers (scientists and payload specialists). Individuals were given two notebooks for their position: one the complete time-based mission script with the lines they say and activities they perform highlighted, and one a background information notebook with details about their role and task. I was a mission scientist. Training was fast and brief. The countdown began at takeoff minus 10 minutes. During the first 8 minutes we were supposed to complete physical exams of the payload specialists and report results to the commander. It was hard to remember what to do, and to take temperature and blood pressure readings for two people with only one set of instruments. Shortly after we achieved orbit, it was time to let the EVA repair team out the airlock to go repair the satellite. We forgot one step in opening the airlock, causing the entire crew to get sucked out to their deaths. However, time continued and so did we. We climbed the ladder into the cockpit and tried to locate and set 12 switches to prepare the lab for our entry, then proceeded to the lab to conduct experiments in space. I spilled chemicals on the floor. My polymer did not harden the way it should have. I reassured my partner, whose experiment took longer than mine, that he still had plenty of time before landing. It turned out I was reading the timeline for the two hour mission, not the 90 minute mission. So, the shuttle landed without us having returned to our stations or performed our landing tasks.

I felt like an idiot the entire time. The other participants had arrived the day before and had already completed two other missions. People said "join the club, we all feel like idiots." This was not a club I wanted to belong to. But, the question is, did I feel present, did I experience a sense of being on a shuttle mission? It is possible my heart rate and skin temperature might have resembled that of an astronaut. However, my mind and emotions were wrapped up in trying to accomplish my assignments. I didn't have time to feel much other than frustration. I had not achieved the kind of insights about shuttle missions I had hoped to experience.

Does our definition of presence presume by being awake we feel present all the time, and it is simply a question of localizing whether we feel present in the real world or in a virtual world? Time pressured, stressful tasks pull attention away from other non-task related current external stimuli (virtual or real), potentially reducing the experience of physical presence. Assigning demanding or stressful tasks in a virtual experience will

likely also distract from feeling present in the environment. Does a demanding task contribute to or detract from the intended experience of presence? Is there a difference between feeling present in a task and feeling present in an environment or event?

The staff began announcing assignments for the next, longer mission. This time I requested a less demanding task and was assigned to be at Mission Control in charge of communication with Space Lab. I had a few lines to read at specific points the script, but mostly I would watch the clock and send faxes to Space Lab at key points in the mission informing them of a new unexpected disaster they had to deal with (such as meteor storms and alien viruses). During this mission I had time to reflect and observe as well as to participate. I was able to shoot still photos and video of the other positions in Mission Control and Space Lab. I was amazed the extent to which space missions are driven by a mission critical clock, how busy people are, how much success and survival depends on many people working together, each responsible for very specific tasks. From moment to moment throughout the 2.5 hour mission I experienced a rich verbal, social, and physical sensory stimuli. I felt strongly and actively present.

Being There: Physical Presence

I believe we need to conceptualize presence more broadly than "the illusion of non-mediation" (Lombard, 2000). If we are to understand the construct, we need to recognize that presence occurs in mediated and non-mediated experiences, and to study and understand the internal state in both contexts.

Ijsselstein and de Ridder (1998) found that the extent of presence experienced in a virtual environment changes continuously. Slater and Steed (1994) measured "breaks in presence" -- shifts away from feeling located in a virtual experience to being aware of the physical world. What is the normal human experience of presence in everyday life? How often and for how long do we feel present in a typical day?

Are there pronounced individual differences in how much presence people experience? The Meijers-Briggs personality test types people as being dominantly Sensate or Intuitive. The majority of people (close to 85%) are sensory types who are "more at

home in the physical material world" (Keirsey, 1998). According to Keirsey, sensate types "focus on what is happening in the here and now" while intuitives focus on "the abstract, conceptual world of ideas-inferences, theories, daydreams, musings, speculations, symbols." Intuitives and sensates are differently aware of the physical world. Is presence for an intuitive more conceptual, while presence for a sensate is more perceptual? Or are sensates more present more of the time than intuitives? Sas and O'Hare (2001) looked at cognitive style and presence but their sample size (12) was too small to detect potential sensate-intuitive differences. (They did find positive correlations for empathy and creative imagination with presence.) I am strongly intuitive, with very low sensate scores. When I think about presence, I think of those relatively rare periods when my usually unrelated-to-the-world-around-me train of thought is most closely tied to current sensory input. Different members of the research community have different personality types and are more conscious of their physical surroundings more of the time. Our personal experiences of presence are not the same, leading to different conceptualizations.

Although the subjective feeling of presence appears to vary from moment to moment, presence is often measured as if it were a static long-term internal state. Researchers expose subjects to a mediated experience that may last anywhere from minutes to hours and then ask "how present did you feel?" For example, Lessiter, Freeman, Keogh, and Davidoff (2000) developed the ITC-SOPI scale for cross media presence using 44 strongly agree-strongly disagree items which factor into physical space, engagement, naturalness, and negative effects. The items ask about presence overall, e.g., "I had a sense of being in the scenes displayed" or "I felt involved (in the displayed environment)". What if the scale were changed from strongly agree/strongly disagree to very often/never? How much presence is enough? Is it better to achieve numerous moments of moderate presence, or one or two peak moments of extreme presence? How frequent and strong a sense of presence do each of us experience throughout a typical day in unmediated life?

Are we always present somewhere, and it's just a question of localizing whether we feel present in the real or mediated world? Waterworth and Waterworth (2001) say no. They write about several kinds of breaks in presence: shifting *locus* between real and virtual

world; shifting *focus* between attending to stimuli present in real or virtual world versus not attending to stimuli in either. They describe the presence-absence focus of attention as a balance between conceptual (abstract) and perceptual (concrete) processing, likening it to a two room house with a single light capable of shining into only one of the two rooms at a time. They characterize presence as "a conscious emphasis on perception of currently present stimuli rather than on conceptual processing" (p. 211).

Is presence exclusively perceptual or can conceptual processing occur as part of feeling present? The Space Camp mission sense of presence I described earlier felt stronger when there I engaged in more conceptual processing. Metzger's (1974) gestalt perspectives on phenomenology and experience define a *percept* as an organism's "reactions to the impingements coming through the senses." Reactions can be conceptual or concrete. The impingements coming through the senses may be real or virtual. Metzger (Brandt and Metzger, 1974) explicates four definitions of reality. Metzger's third definition relates best to presence: real3 is "what is encountered, found, or produced" whereas unreal3 is "what is merely thought, imagined, conjectured, foreseen, conceptually known, planned, and//or intended." Humans encounter not only external stimuli but also their own "feelings, moods, aspirations, inclinations, etc." Applying these perspectives, presence can encompass both concrete and abstract thought, so long as it is closely tied to current impingements to the senses. Presence happens in real time. Presence involves encountering, finding, or producing (imagining) impingements that come through the senses and then reacting to them.

Is "being there" about being in a place or being in an experience? Marsh (2001) suggests "experiences encountered in virtual places provide a sense of having been present somewhere else." Is there a difference in how present "being there" feels between visiting Mission Control late some night when no people are present and no missions are underway (or exploring a static, unpopulated 3D model of Mission Control) versus being at Mission Control during a launch? Is there a difference in the nature of presence experienced between being a scientist working at a station during a launch at Mission Control versus being an observer of that launch? When I design a virtual world, the "there" of interest in "being there" is not a place, but the entire gestalt experience. My goal is to encourage or induce the participant to be actively, intensely, perceptually and cognitively involved (to

be present). Physical presence is a subset of presence concerned with conceptual and perceptual reactions to the perceived physical environment. The "illusion of non-mediation" is likely accompanied by a strong sense of physical presence in a mediated experience.

Presence is contextual. Although the duration of feeling present may be very short, presence is dependent upon a context larger than that moment to comprehend the experience before you can feel present in it. What if my physical body was magically transported to an entirely different situation half a second, then transported back. For example, I am sitting at a desk using my computer. Suddenly for half a second I am at the table in a darkened restaurant. Then back at my desk. Let's say I really was physically present in the restaurant for that half second. Would I have felt present? Probably not. There was no time to comprehend what was going on within or around me. How much context is needed before the feeling of presence occurs? How much sense-making precedes feeling present? It depends on the complexity of the experience.

The impingements on our senses are fragmented and incomplete (McCloud, 1993). We "commit closure, mentally completing that which is incomplete based on past experience." Do we need to be attending to all current impingements to the senses to feel present, or can one focus attention on a particular perception (such as the voice of someone on the telephone, or one particular actor on the stage)? Is presence stronger when attention is focused or diffused across more stimuli and more senses? We notice the anomalies, the bumps in the road, more vividly than we experience expected and repetitive sensory input. Do we feel more presence on bumpy roads? Ijsselsteijn, Bierhoff, and Slangen-de Kort (2001) postulated and found some support for a relationship between duration of time estimates and sense of presence. More attention and engagement is expected to be associated with faster perceived passing of time and stronger sense of presence.

Is feeling present an art? Is it voluntary or involuntary? Can it be learned? McCloud (1993) describes the comic book audience as a silent collaborator, filling in change, time, and motion between frames. Other media require similar audience participation. The expression "to be present in the moment" refers to experiencing, participating in, fully

appreciating what is happening now. The (new age) book, "Present Moment, Wonderful Moment" contains "verses for waking up to '24 brand new hours,' taking a shower, answering the telephone, and starting the car." (http://www.villagebooks-mtshasta.com/presmomwonmo.html). Being present in the moment described in these books as a learnable skill (remembering to stop and smell the roses…).

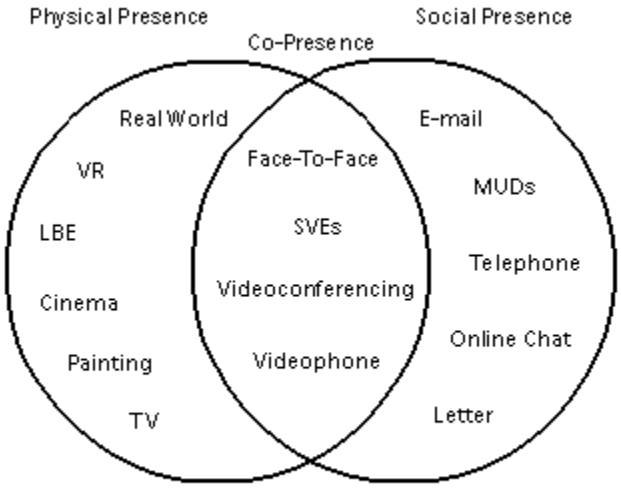
Although many of us may have felt present, the details of my Space Camp shuttle mission experience were different from that of every other position assignment. Is there a common experience of presence, or does presence feel different to each individual and in each situation? Is presence a content-free feeling like arousal? Does the subjective feeling of presence feel the same regardless of whether one feels present sitting on a beach in Hawaii or washing a car? Presence is a series of moments when cognitive *and* perceptual reactions are closely tied to current sensory impingements. A conscious effort or task-oriented need to stay focused on the moment facilitates but is not required for the state of feeling present. Reacting to an immediate danger would also encourage close attention to current sensory impingements. Complex, compelling, or intense stimuli that change over time facilitate but are not required for the state of feeling present. Presence requires a context and can be enhanced by familiarity, prior experience, and a rich cognitive schema. The perceived potential for interaction (affordances) acting upon or being acted upon may increase presence. Presence varies in duration, intensity, and complexity.

What does presence have to do with technology? Nothing. What does technology have to do with presence? We use technology to design experiences. The design parameters include engineering optimal levels of presence for a particular experience (described by Kim, 2001, as "tuning the level of presence"). Technologies may also have unintended presence consequences. Even when technology is involved, it is the experience itself (the mediated content) and not technology alone that evokes the subjective experience of presence.

Being With: Telerelating

For the last four years I have lived in San Francisco while working as a full time professor of Telecommunication for Michigan State University. I teach online, participate in faculty meetings and student committees, run the Comm Tech Lab, work with MSU Virtual University on development of online teaching tools and techniques, and reach out to distant friends and family, all from a basement home office 2500+ miles away. The majority of my professional and personal relationships are distant and mediated. I call what I do "telerelating" (Heeter, 1998): forming, maintaining, and enhancing relationships at a distance using technology.

Ijsselsteijn, Freeman, and De Ridder (2001) illustrate the relationship between physical presence and social presence. The two constructs overlap in co-presence where social participants share a virtual space. I modified the diagram slightly, adding the Real World to the set of physical presence environments, and adding face-to-face to co-presence.



adapted from Ijsselsteijn, Freeman, & De Ridder
Cyberpsychology & Behavior, v4 no2, 2001

Telerelating includes all social presence situations except face-to-face if no technology is involved in that face-to-face encounter. Telerelating is almost the opposite of presence. Telerelating is concerned with how interactions contribute to the totality of an interpersonal relationship that develops over time, while presence a momentary subjective state of reacting to current impinging sensory stimuli. *Experienced* social presence the particular feeling of connectedness experienced by a person during a specific use of technology for telerelating. Like the general concept of presence, experienced social presence is tied to a specific experience at a particular point in time.

Also like the general concept of presence, experienced social presence is contextual, dependent upon the history of the relationship, the communication content of the interaction, and the communication characteristics of the medium used in the interaction. Nowak (2001) differentiates the act of perceiving another from feeling that you are being perceived. *Expected* social presence is the potential of a communication medium to facilitate meaningful social interaction.

In the physical world, people are embodied (Biocca, 2000.). The body separates, integrates, and represents us in the world. Communication technologies separate, integrate and represent the body in a mediated world. They limit, eliminate, and sometimes amplify or alter our normal body input/output perceptions and interactions. Context is less visible (but more flexible) and must be inferred to a greater extent.

Biocca, Burgoon, Harms, Gregg, Stoner, and Vitrano (2001) describe unbalanced, asymmetrical telerelating interfaces where some participants have more or less bandwidth and more or less sophisticated interfaces as other partipating the same virtual world. Much of my telerelating takes place through asymmetrical social presence interactions with a slightly different twist, where I am the only virtual participant with groups of humans who are together in the real world. Being virtual for four years, I am extremely conscious of whether each of my telerelating relationships is symmetrical or asymmetrical.

My relationship with my students is symmetrical. We meet in cyberspace, through email, web sites, personal portfolios, live chat, and asynchronous discussion. Everyone is virtual. Each post we make to the asynchronous discussion board is accompanied by a copy of a tiny personal photo. Students' personal portfolio pages include a larger image of the same photo. As we get to know each other, we associate our mental model of each individual with this single image. Biocca et al. (2001) would say we construct simulations of each other, tied visually to the single image we have of that person. Some students post high school prom pictures, other post artsy close-ups of an eyeball. It was odd to have a cartoon character as a student. But it was also fascinating. The most difficult to having a scenic beach photograph as a student. I had difficulty thinking of the beach as a person, or the person as a beach. Except for the beach scene person,

relationships we establish throughout the semester tend to be strong and personal. Students often remark, “it’s so nice to take a class where you actually get to know the professor and other students.” That’s a funny thing to hear from both MSU students and from students in jungle villages in Sumatra, Indonesia who take my virtual courses. It is very strange the first time I in person meet someone I feel I already know very well virtually after 15 weeks or interacting online. Bodies and mannerisms almost get in the way of the pure essence of knowing each other that has been established. A single photograph is very different than seeing someone in person, in 3D. In fact, it is easier to visualize a single photograph than to conjure up a specific image of the face of someone I know face to face because they look different at every angle. Which angle do you think of when you call up the visual memory of a three dimensional person? My mental picture (simulation) people I have met in person is sketchier and more general than my mental picture of the students who I know through a single photo. But it is far easier to recognize someone based on the more general image.

Asymmetrical telerelating is harder to establish and sustain than the symmetry of online learning, conference calls, or even normal phone calls. The remote being’s virtual presence is both a privilege and a handicap. The physically present humans need to exercise some tolerance and flexibility and to make some extra effort to include the remote human. But the burden of adapting and reaching out rests with the remote human who needs to make the remote relationship work and not with the physically present others who have many other, easier social alternatives. It can be done and it can be effective and personal.

I initially participated in faculty meetings via speakerphone only. My self-image is a small triangular gray box. I felt a need for a stronger visual representation so my fellow faculty members were more aware of my presence. We tried taping my photograph to a coat rack and giving it a spot at the table. At future meetings next year I will be visually represented by a bobo doll (known in today’s toy stores as an “inflatable Batman bop bag” toy) with my photo taped on, seated in one of the chairs. When I frustrate the group they can punch me to relieve aggression. The bop bag carries the symbolic social message, Carrie is here at the meeting.

For research team meetings and as part of my general Comm Tech Lab social presence, I use an Internet-ready picture frame which I fill with anywhere from 1 to 20 images appropriate to the particular meeting or day to be a "Carrie presence" at the conference room table. Last month I mailed a box with 14 wrapped, numbered packages of chocolate to the lab, so at appropriate moments of team accomplishment I can ask that "package B" be unwrapped and shared. (What is the social presence impact of a virtual participant offering the group a physical bag of m&ms?)

My circumstance may be unique, but the need for asymmetrical virtual presence in physical social environments is not unique. Corporate research laboratories frequently want to incorporate international participants separated by long distances. Handicapped or physically distant students may wish to virtually participate in classroom-based classes. The Comm Tech Lab, MIND Lab, and State of Michigan Office of Senior Services recently completed a grant-funded TeleWindows project where we used picture phones to connect homebound elderly to the Senior Centers they used to attend (Heeter, Gregg, Climo, Biocca, and Dekker, 2001). Picture phone technology is not widely used, but has been available for many years. What is unusual about the project is how the picture phones were used. Unlike a typical telephone call, we asked the senior center and participant to leave the picturephone connected for long periods of time (5 to 7 hours) to provide a casual presence rather than just connecting for a conversation and then hanging up.

Much of the research on social presence has studied mediated communication between strangers who have never met each other face to face (e.g., Sudaweeks, McLaughlin, and Rafaeli, 1998). Other social presence research compares effectiveness of different technological channels for organizational communication, in a context where face-to-face and other communication alternatives (email, phone, letter) are equally possible (e.g., Rice, 1993). Our application is different. Telewindows are not being used to introduce strangers. The interpersonal relationships between a homebound elderly person and the Senior or Adult Day Care Center they recently were part of are already established. People know each other; they have accumulated what Clark and Brennan (1993) describe as common ground – "mutual knowledge, mutual beliefs, and mutual assumptions" exchanged through ongoing social encounters which lead to "a mutual belief that they

share a common understanding" (Preece, 2000). The homebound participant has a vivid mental model of the Senior Center physical and social space. The accuracy of the common ground is likely to decay based on how long ago the homebound person actively participated in the Center, how many people have joined or stopped coming to the Center, and also whether the Center has experienced social-cultural (or physical) changes since the homebound person was last physically present. Believing there is common ground presumably impacts on sense of social presence even if the beliefs and assumptions thought to be shared are not completely accurate.

Lombard and Ditton (2001) suggests *social presence* "occurs when part or all of a person's perception fails to accurately acknowledge the role of technology that makes it appear that s/he is communicating with one or more other people or entities." This definition implies humans should be and are constantly and consciously acknowledging the role of technology while we try to communicate with distant others. Occasional lapses in this vigilance (whether due to compelling special effects or the human's power of imagination) yield a sense of presence.

Compelling aspects of social presence via a Telewindow relate more to exercising interpersonal relationships than to forgetting technology is part of the experience. The goal of the homebound Telewindow user is to visit the Center and experience meaningful connections with other Center participants despite handicaps inherent in the system. It is unlikely homebound participants will report "I forgot I was watching fuzzy, bad quality video and thought I could actually pick up the ping pong paddle and play." It's unlikely the Center participants will suggest "I forgot she was homebound, it seemed like she was sitting right here." We hope a homebound person might say, "it was great to see and talk to my friends, and to find new ways to participate in some of my favorite activities."

In a dyadic telephone conversation, both parties converse in a shared audio space, separate from each individual's local audio space. They meet in an abstract audio space. Conversely, Telewindows draw attention to differences in participant's local spaces by showing video of each individual and their surroundings. Users have the option of viewing either the distant party or else a split screen showing themselves and the distant party. Do Telewindows provide more or less social presence than a phone call? A

Telewindow is a richer medium then telephone because it has both audio and video, and thus provides more social bandwidth. Yet the video draws attention to a lack of shared physical space, possibly inhibiting rather than enhancing social presence. The Telewindow presents proof of not being there.

Like telecommuting to Michigan from San Francisco, being part of a Senior Center via a Telewindow instead of in person is both a privilege (compared to being home alone) a handicap (compared to being at the Center in person). The connections only happen at periodic times planned by Center staff. Participants can only see where the camera is pointing and can only talk to people who are near the speakerphone. The connection is asymmetrical in many respects. People at the Center see a fairly close-up shot of the homebound participant, and generally can hear what the homebound person says. But the homebound person sees a wide shot set up to show as much of the Center as possible. Therefore, people at the center appear smaller and it may be harder to distinguish their facial expressions or even recognize people over the relatively poor quality video. It can be hard for the homebound person to hear participants at the Center who are not near the phone. The homebound person is usually alone or with a caregiver, while people at the Center can interact with many other physically present people. The need and desire for social connection is much stronger for the homebound person than for physically present Center staff and seniors.

Perception		Homebound	Center
Visual	≠	Homebound has a hard time seeing due to wide, fuzzy camera shot of many people	Center can quite easily see closeup of homebound person
Auditory	≠	Homebound may have trouble hearing those far from the speakerphone or Center may be noisy and hard to hear conversations.	Center can quite easily hear homebound person because that person is near the phone and their environment is quiet.
Control	≠	Homebound person has no control over where the camera points, can only see what is in the shot. Also, no ability to touch, eat, or physically construct.	Center participants can walk or look all around the center, touch, eat, and physically construct.
Representation			

Visual	≈	Homebound is represented visually by video of their body.	Center participants are represented visually by video of their bodies.
Auditory	≈	Homebound is represented auditorily by audio of their voice.	Center participants are represented auditorily by audio of their voice.
Control	≈	Control of their representation is natural: speak, move, smile...	Control of their representation is natural: speak, move, smile...
Other Factors			
Local humans	≠	Homebound have no local humans to interact with.	Center participants have many local humans to interact with
Yearning/need	≠	Homebound have strong yearning/need to interact using the Telewindow.	Staff have commitment for the project to use the Telewindow, but seniors have little or no yearning or deep need to interact with the homebound person.

Some of the asymmetries balance each other. It is probably necessary that the homebound person be easy to see and hear, to help compensate for the comparative lack of yearning on the part of Center participants and for the easy availability of other humans. The homebound person will be more tolerant of system faults such as lack of mobility and poor quality in return for being able to connect at all.

Four recently homebound seniors participated in the project: three women and one man all in their mid to late 80s. Three had participated in their local Senior Center one was a recent Adult Day Care Center participant who had advanced Alzheimer's. They were interviewed, Telewindows were installed in their home and their Center, the Telewindow was used for at least 10 weeks, and they were interviewed again. Staff at each of the four participating centers kept a daily log of Telewindow activities. Surveys were administered to staff and seniors at the centers at the beginning, middle and end of the ten week the Telewindows project at each location. Details about the are available from the online project report (Heeter, Gregg, Climo, Biocca, and Dekker, 2001).

Both before seeing the Telewindow and after using one over a ten week period, about half of seniors and staff at participating centers indicated they would like to use a Telewindow themselves if they become homebound. Only about one fourth of seniors and staff definitely did not want to use one. The three homebound senior participants

who understood the device's function were enthusiastic about the experience. The two who remained homebound wanted to continue using the Telewindow after the project ended. The third recovered from his serious accident and was able to return to the Center in person. Thus, the Telewindow was not a substitute for Bob physically being at the Center – when he was capable of doing so, he preferred to attend in person. But while homebound, visiting by Telewindow was better than not visiting at all.

Staff at the Centers connecting to Bob and Helen reported observing improvements in their demeanor and social connections. A major apparent benefit of the Telewindow was that Bob became much more social as time went on. After a serious accident he had been quite depressed and withdrawn. As he was able to see friends at his community senior center he became more social and animated. The center staff reported that the Telewindow allowed him to gradually return to activities, while being able to shut it off when he felt tired or depressed. Helen commented that the Telewindow opened her world back up. She was able to have conversations with her friends, and even attended special events via the Telewindow system. Having been unable to attend the senior center for seven years, Velma learned when she starting using the Telewindow that many of her former friends were no longer active at the senior center. Even so, she appreciated being able to use the device to connect to the Center, and wants to try connecting to her church. Joan was not able to use the system due to cognitive limitations. There is no way of knowing what participants attitudes and progress would have been without a Telewindow. We can conclude the results were encouraging. The asymmetrical social presence TeleWindows provided was not as good as being at the Senior Center, but it was better than not being there.

Next Steps

The Presence 2001 Workshop was a delightful chance to meet outstanding researchers in the field and to listen to interesting presentations. The hardest part of being there (in person!) for me was feeling obligated to look like I was listening for three whole days. It was not hard to listen, that was great. But as a full time telerelater, I am not accustomed to having to worry about what my body appears to be doing. During virtual meetings my body may be responding to email, cleaning the house, nuzzling a cat, lying on the floor.

My body is almost never sitting at a desk with hands folded looking at PowerPoint slides while someone talks. Of course, it would be distracting if some or all of a physically present audience stopped looking like they were listening. We may need rooms full of bobo dolls who look like they are listening, representing humans who actually are listening but don't look like it.

Anderson, Nahella, Douther, and Jack (2001) created a shared space conferencing system that invoked a strong sense of involvement and presence for users. Their research identified a need for "selective realism" of system elements including human representations. Sometimes less realism is better than more realism. The conference space was a conference room with entryway, paralleling real world work environments. The representations were humanoid. Participants chose avatars that resembled their own physical characteristics to represent themselves in interactions with their colleagues. The participants knew each other and were professionals who worked together regularly.

Sadagic, Towles, Holden, Daniilidis, and Zeleznik (2001) are engineering advanced realism in remote collaboration. They are developing a "tele-immersion portal" where participants see a live 3D photorealistic model of each other in their natural office and can jointly manipulate and view 3D objects.

As distance and technology free me from the constraints of physical embodiment and the real world, I am interested in experimenting with how greater-than-real-world freedom in representation of self and in the choice of context might impact social presence. So much more is possible in a virtual world than in the real world. What if we do not meet in a conference room? What if we meet inside of the computer software we're creating? Or in Mission Control? What if, like an actress in a play, the staging and my appearance change between scenes? I am working to create new telerelating tool called Performance Communication. The target specifications for the Performance Communication system include:

> Representation of Self: At its simplest implementation, video of a performer is chromakeyed into their slide show. The performer can control the size and location of their image, down to 1/16th of the screen. If they wish, the performer

can pause the video to allow their body to go do something as they continue to talk. Or, an avatar can be selected to represent the performer.

Context: In the real world we are stuck with the laws of physics and the location our bodies are located in. Technology allows flexibility of context. A performer can appear in a plain colored background, in a PowerPoint slide show, inside the computer desktop, inside live video of a volcano, inside a virtual world.

Co-Presence: The system can be used to prerecord or deliver a live presentation. It can also be used to represent a remote participant who is part of a physically present group. Or it can provide co-presence. Two or more performers can share the virtual space as they interact with each other and the environment.

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