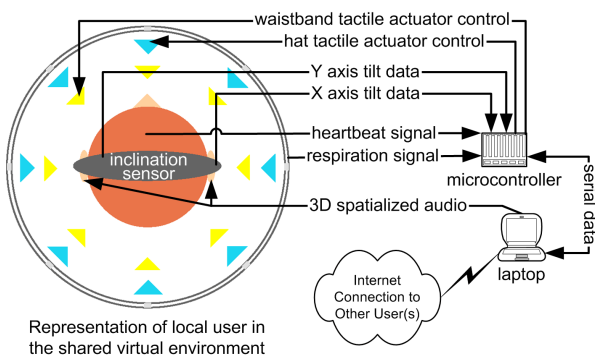


The Body's Surface as a Multimedia Interface: Closed-Eyes Nonverbal Telehaptic Communication

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Closed-eye internal experiences, such as meditative and lucid dreaming states, may be rich and deeply profound or distressingly dark, yet are always solitary. Computer generated tactile (haptic) sensations over networks, known as "telehaptics," may be a technological stepping-stone for exploring communication or empathetic sharing of such intangible content. Two networked prototypes were developed to prove the concept that real-time dynamic physiological measures made during such private experiences can be harnessed to provide channels of nonverbal communication between remote individuals. Communication between users is achieved by sensing subtle volitional muscle movements, breathing, and heartbeats, then presenting this information to the other user, via subtle haptic and sound cues. More subtle real-time biometric measures (similarly affected by changing thoughts and emotions) could be output as mild thermo-, vibro-, and/or electro-tactile stimulation on a distant partner's bodily surface. What one's body might "understand" from another in this unique way is an intriguing area for further research.



Representation of local user in the shared virtual environment

Figure 1. Diagram of system configuration. All data is symbolic, consuming very low network bandwidth.

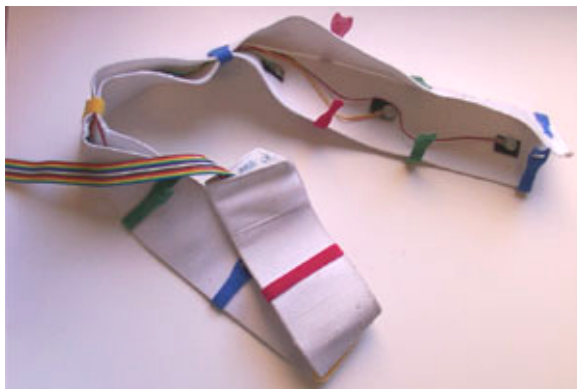


Figure 2. Elastic and Velcro waistband with tactile actuators (pager vibrators), that allow users to sense heartbeats and location in virtual space.

By design, communication involves minimal stimuli layered with deeper information about both one's own and a partner's physiological states (e.g. breathing and heart rates). In pilot testing with users' eyes closed in a shared virtual space, users (couples or

relations) navigated by using their heads as "joysticks" (head tilt sensed via accelerometers in hats), and felt their own and a partner's location as vibrations (actual recreated heartbeats, stronger with closer virtual proximity) through eight tiny pager vibrators equally spaced around both waist and head. Users heard each other's breath as 3D spatialized musical notes. Interactions were observable (via computer displays) by third parties, and patterns could trigger software events or network connections, or be re-experienced later if stored. User pairs reported feeling a strong sense of their remote (Internet connected) partners' physical presences.

Users with closed eyes likewise reported surprise at having actual experiences of bodily immersion. Eliminating visual and verbal stimulation (and minimizing other sensory input) may coax the imagination into generating its own images (or perhaps visual environment). Virtual positions via biometric feedback are precisely presented, while intuitions, feelings, thoughts and/or psychological projections (classic objects of meditative attention) are deliberately given more of an opportunity to spontaneously manifest interesting supplemental content—to support perceptual gestalts of one's partner and the shared, imagined environment. Pilot testing with five couples, employing the Profile of Mood States (POMS), suggested some degree of emotional content may be transmittable. Further research with a greater number of trials and/or larger sample sizes is necessary to refine biometric input/output mappings, quantify measures of presence, immersion and emotional communication, and test for statistical significances. This new class of networked human interaction may open a doorway to new forms of nonverbal interpersonal emotional communication.

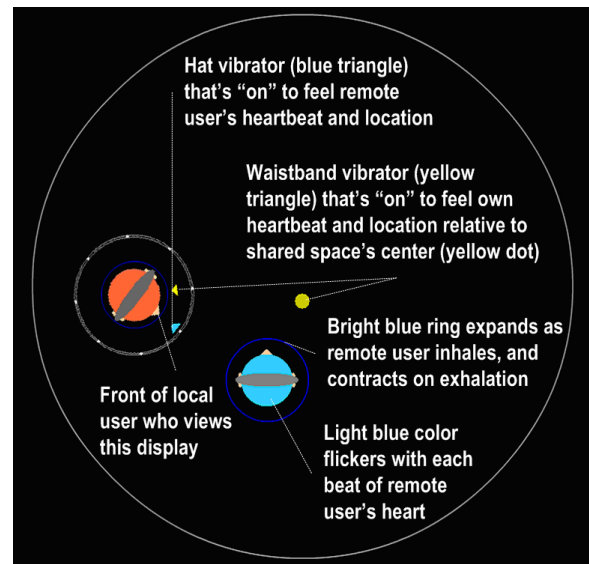


Figure 3. Real-time map of virtual environment, viewable by third party observers.

References

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